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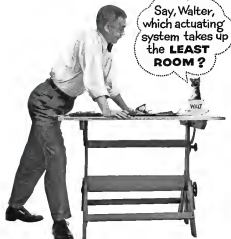
Solving these fuel metering problems is often a task so arduous one demands computers every 60 seconds! The Holley Turbine Control was developed to do the job.

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A-1



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5974 • J. Neurosci., September 24, 2008 • 28(39):5970–5974

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⁴ *History of the Church*, 10:3.

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198. *Journal article in the field of Psychology* Journal Name: *Journal of Experimental Psychology: Applied*
 Author: *John A. Byrne, Robert C. Serfaty, and Robert C. Serfaty*
 Title: *Memory for the location of objects in a 3D space*
 Journal: *Journal of Experimental Psychology: Applied*, 1998, 4(1), 1-10
 Abstract: *Three experiments were conducted to investigate memory for the location of objects in a 3D space. In Experiment 1, participants were asked to remember the location of objects in a 3D space. In Experiment 2, participants were asked to remember the location of objects in a 3D space. In Experiment 3, participants were asked to remember the location of objects in a 3D space.*

Phillips 66
PRESENTS

6 MILESTONES IN AVIATION

Flying Coast Guard



In 1915 three officers of the U.S. Coast Guard, using an airplane borrowed from the Navy, proved the value of aviation as a searching tool and doubled work on the Atlantic Coast. In 1916 Congress authorized the Treasury Department to establish the Coast Guard Air Station along our coast, but it was many years before such authorization was granted. Meanwhile, however, the idea was kept alive by the efforts of a few so-called Coast Guardsmen, who, although they had no official status, kept the idea alive.

Inside the Thomson, the held swimmers of smugglers and nine passengers brought a sizable opposition on for planes and Coast Guard Air Station. Since that time, U. S. Coast Guard Air Station has joined off available services as war and peace from the Tacoma to the Arctic.



For more than 30 years, the research and development activities of Phillips Petroleum Company have been actively concerned with aviation fuels and lubricants. Today, the Phillips research staff is constantly working on problems related to aviation.

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NEWS DIGEST

Domestic

Three World Airlines 2-2-2 and an executive DC-3 collided last week in a mid-air crash southwest of the Greater Cincinnati Airport, killing 35 persons on the TWA transport and two on the business plane.

Major Airlines' Lashcoes crashed on takeoff from St. Petersburg, Fla., but the 30 passengers and three crewmen escaped from the burning transport without injury. Witnesses said the Lashcoes' power apparently failed as it became airborne.

Super Constellation refloated at Lockheed Aircraft Corp.'s Burbank plant but may leave all company records for civil transport production, increasing to 41 airlines with a combined value of more than \$70 million. Boeing Dec. 31-65 Super Constellation.

Low flying suit to improve aircraft traffic on aircraft traffic at Newark (N. J.) Airport was drafted last week by Fed. and Judge William H. Smith after an assistant U. S. attorney challenged the court's jurisdiction over the federal government and Civil Aeronautics Administration. A second section of the suit, brought against the Port of New York Authority and seven airlines by New Jersey municipal groups, still is awaiting trial.

New sub-orbit radar transponder beacon, developed by Malpas, will get its first industry showing Jan. 25 at a closed Air Transport Assn. meeting in Indianapolis. Six of the new 270-beacon were installed recently on Labor Control Airlines' fleet of DC-6s as part of Air Navigation Development Board's evaluation program. (Aeronautics News 8, p. 11). The beacons are expected to increase the effectiveness of ground radar traffic control.

Lockheed Aircraft Corp. broke ground last week at Van Nuys, Calif., for a new \$4 million guided missile assembly laboratory, the last of four similar structures to be built for the company's Missile Systems Division under a \$110-million master development program.

Kanair Aircraft Corp. has formed a new wholly owned subsidiary, Kanair Aircraft of Canada at St. Catharines, Ont.

Bendix Aviation Corp. has set up an Aircraft Products Division of its wholly owned subsidiary, Bendix-Bishop, at Canada, Ltd. The new division now is in inspection offices at Toronto.



Navy Copter Gets Big Power Boost

Wight R2100-3 engine of 700 hp is fitted in this modification of the Pando H10-2 helicopter, usually powered by a C550hp. Customized R2100-3, H10-2 is the designation of the new Pando. The program covers two phases: (1) installation of the R2100-3 for flight tests and (2) incorporation of new dynamic components capable of fully utilizing the increased power. The Pando H10-2, H10-3 and H10-4 all are scheduled to have the improved performance of the H10-2.

New 120-million building will begin next May at McClellan Air Force Base near Sacramento, Calif., will include hangars, supply and operational buildings for the Air Defense Command's 4th Air Division early warning packet and plan expansion of warehouse facilities.

An Force plans to take over facilities of Army's Materiel, Pa., transportation depot, due to critical USAF need for storage space in the area. By consolidating the storage activities of the Materiel depot with the New Castle, Pa., depot, Defense Department estimates \$1.5 million annual decrease in operating costs.

Financial

De Havilland Aircraft of Canada, Ltd., Toronto, reports a net profit of \$121,994 for the fiscal year ended Sept. 30, dropping from \$177,160 for the previous 12-month period. The company says its losses partly reflect the cost of moving into its new \$80,000-yr. plant (Aeronautics News Aug. 23, p. 34).

Fleet Manufacturing Co., Ft. Erie, Ont., Canada's sole manufacturer for Deere, Minneapolis and Harco Aircraft Corp., had a net profit of \$416,459 for 1964, compared with \$481,264 in 1963.

International

Production contract of two-jet CF-105 will begin late this month at A. V. Roe Canada's Toronto plant, extending

work on the all-weather fighter until the new delta-wing CF-105 is ready for assembly later in 1968. The deal, ordered by the Canadian government, will bring down to 100 off about 1,000 employees and cut production 30%.

Saskatchewan Government Aircraft two-engine transport crashed 85 mi from Prince Albert, Sask., Jan. 6, killing seven persons, according to press reports from Canada. The reports did not identify the transport, but the non-scheduled, unlicensed two-engine transport includes only those Aeromex and two DC-6s.

Pakistan International Airlines, semi-government-owned carrier formed through nationalization of the country's Orient Airways and National Air Co., is scheduled to begin Karachi-Canton service Jan. 18, according to press reports. Capitalization of the airline now exceeds \$14,500,000.

Allied Airlines, St. Louis, is one of the late Const. Vee Zeppelin and founder of one of the world's last dirigible airlines, the German Airship Travel Co., died Jan. 9 at Detmold, Germany.

Fifty Army Canada CF-300s will be converted to dual-control trainers by Canada's McDonnell-Bendix Aircraft, Ltd., Winnipeg, under a new contract from the Royal Canadian Air Force. Total contract: \$3 million.

Finland is negotiating with Russia for MIG-17 jet fighters, according to local press reports in Helsinki.

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The Aviation Week

January 17, 1955

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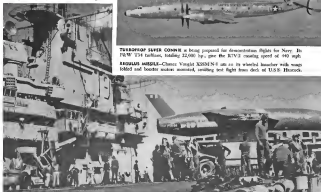


Airpower Takes Many Shapes

MAGICAL RAPIDNESS of Boeing B-57B by Boeing KC-97T tanker (bottom) indicates that great jets almost unlimited range.



TWENTY-FOUR SEVEN COMBAT is being prepared for demonstration flights for Navy. Its 10,000 T-34 tailfin, totaling 22,000 hp., give the BTV-2 cruising speed of 440 mph.
REGULUS MISSILE—Chrysler Vought X-204 N-6 can do its wheeled launcher with wings folded and booster action mounted, enabling test flight from deck of U.S.S. Hornet.





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WHO'S WHERE

In the Front Office

Charles D. Devery has resigned as president manager of American Radiator Div. of Fairchild Engine & Airplane Co. to devote his full time to being president of Mid-Continent Manufacturing, Inc., Missoula, Mont., Calif. aircraft subcontractor.

John A. Thompson, assistant counsel for Kowalewicz Aviation Corp., has taken on additional duties as attorney at the Palm Springs, N. Y., company. Thomas Davis, assistant secretary there, now will give full time to his position as treasurer.

Changes

John G. Lee a new director of research for United Aircraft Corp., succeeding Frank W. Oldfield, who retired after serving 15 yrs. with UAC and its Hamilton Standard Division.

R. James Fowler has been appointed commercial sales director for Fairchild Engine & Airplane Corp., Hagerstown, Md. A. G. Guehring has been appointed to assistant general manager of Rando Aviation Corp.'s piston engine section, Milledale, N.Y. W. F. Sullivan is a new assistant director-engineering of the section.

Bruce F. Glavin has become chief engineer of Electrocontrol Inc., Pasadena, Calif., and has taken over the firm's new Instrumentation Division.

André E. Tullier has been appointed publicity and media editor of the New York Herald Tribune.

Honors and Elections

Robert F. Goss, president and board chairman of Lockheed Aircraft Corp., has been elected president of the Institute of the Aeronautical Sciences for 1955, and ending J. A. Alford, president of North American Aviation, Inc. New USAF vice presidents for 1955: **Roger Wallis Kahn**, first vice president, **Gustavus A. Smith**, Jr., Engineering Group, Dr. **Edward R. Sharp**, director of Lewis Field Propulsion Laboratory of the National Advisory Commission on Aeronautics, **Edward C. Wells**, vice president engineering, **James A. Johnson**.

C. T. Church, **Ross**, president of Aero Associates Co. New officers: **Charles H. Cohen**.

F. E. Carroll, Jr., chief engineer of United Aircraft Products, Inc., has finished his work as vice president steering personnel affairs of the Society of Automotive Engineers in its public anniversary annual meeting in Detroit.

Walter Taylor, chief engineer at Fairchild Engine & Airplane Corp., Hagerstown, Md., has been elected chairman of the 1955 Air Corps Advisory Committee, National Security Institute. **Alan George W. Wenzel**, preliminary design engineer for Fairchild, and **Robert W. Johnson**, industrial relations representative, will serve as members of the committee. **L. R. Hadden**, Fairchild administrative assistant, is new chairman of the defense task committee.

INDUSTRY OBSERVER

► **Boeing Helicopter Corp.** will put its military H-21 Work Horse helicopter through CAA certification this year and estimates it will be ready for delivery to potential operators as early 1956. **Covington Work Horse** will be the H-21, modification of the USAF and Army H-21B and C, grossing 11,300 lb. with 15 to 20 tons payload. Price \$250,000 to \$275,000, depending on equipment and furnishings. **Boeing** certification will be in customer's order. Powerplant being used is Wright J35-355 engine, which provides 1,455 hp at 6,500.

► **First production plastic drop tank** to go into production in this country will be built by Chicago Midland Products Corp., a division of Adams Aircraft Corp., which conducted the 15,000 of the eleven plastic-reinforced 225-gal. units. Company got green light to go ahead, once drop tank has not passed its first flight tests. Tank is a Type IV, loaded service unit, completely assembled at the factory (Aviation Week Jan. 5, p. 54).

► **Chrysler Veight's Republic** turbine-turboprop engine, fitted with fuel injection meter wing pump, is scheduled to make its first flight this month. The new push-overloading the section outward of the wing (tail-weight 163 lb.), compared with 228 lb. for standard construction, and are expected to cut cost and speed production. Republic engine-propeller panel is made by R. H. Chrysler, Inc., Los Angeles. **Chrysler Veight** also is investigating the possibility of carrying Republic deliveries from engineers to replace present assemblies.

► **Lockheed Aircraft Corp.** has opened a senior school of its Monrovia, Cal., plant to train engineers and for France personnel in maintenance and use of the new C-130 Hercules transport. Georgia placed a sole source for the C-130. Its first Hercules is expected to fly this spring.

► **First Italian-built North American F-86 Sabre jet** is expected to come off the first assembly line at Turin in April. Fifty Sabres are being built by Fiat for NATO under a \$2.5 million offset procurement program (Aviation Week Aug. 2, 1954, p. 56).

► **Australia** studies now in the U.S. looking for replacement aircraft for the Royal Australian Air Force probably will select the British Avon Vulcan as their bomber, London sources report. **Todd** machines are expected. Some will be produced in Britain, others in Australia. Present B-5 plane production run of F-86 Sabres in Australia may be extended by 15 planes to keep them working during tooling for a new fighter.

► **Name of Hughes Aircraft Co.** may be changed. Aircraft, aircraft and aerospace activities would be placed under an aircraft division of Hughes Tool Co., has control and other divisions would be carried on by a Hughes Electronics Development Co. This would confirm an arrangement which has been in contract since Howard Hughes gave the service contract of the company to Howard Hughes Medical Institute a year ago (Aviation Week Jan. 15, 1954, p. 18).

► **USAF** continues to wrestle with problem of two powered fighter planes. Republic F-84F cannot be flown if it is powered in the Wright J65-9, B-57C-1 or YF-102 and has less than 1000 hp. **North American** F-100 Super Sabre will stay powered while evolution is made of changes aimed at increasing high speed wing condition. Only test aircraft are being at the present time.

► **Hughes Aircraft Co.** has been flying a C-119 from its Culver City Airport for evaluation of the Hughes-built fire control system.

► **Army** is preparing to order a substantial number of de Havilland Otter, designed in Canada. Otter is capable of carrying 14 equipped soldiers and other ammunition. Early flight of the Otter is just before the 5,000th. **Boeing** specified for Army fire-control aircraft is an agreement with the United States Air Force.

Procurement Investigation

Defense Secretary Clinton E. Wilson's insistence that he did not receive his permanent policy brief, much as he was referred the armed forces to spend their contracts among more products is one of the topics most certainly behind his congressional investigations.

In addition to the Pentagon grant cups and a list of contractors, there are at least two more in Capitol Hill who remain skeptical. They are Senator Fritz Klobuchar (D., Va.) and Henry M. Jackson (D., Wash.)—the same men who led the new Wilson doctrine in a sign that big corporations would be forced to share the gains. Wilson set down their bill by announcing (a) that he had not changed policy, and (b) that he didn't have time to tell the senators about his director's review.

(Aviation Week Jan. 7, p. 12)

Referring to his permanent policy brief, Wilson told the senators: And Jackson will look into the procurement reviewed by the Armed Services Committee.

Meanwhile, Wilson's denial of a shift in policy has proved to subvert from the Office of Defense Policy, which they have set a goal of dropping up to 40% of military production over the 75 budget years.

ODPM finds that the Wilson doctrine is a good change, allowing previous plans to be paid when necessary is dispersed, high-cost products.

Service to India

The bilateral agreement with India has expired with-out a new one being signed, although talks have been going on for several months. Big remaining block is India's withdrawal on land-to-air contract. State Department insists that no contract should be put on trade until damage to a local owner is established, while India wants to wait until the agreement expires in the interest of saving Air India a loss.

While talks continue, the American World Airways and Trans World Airlines will be allowed to operate two roundtrips weekly instead of three as in the past.

In a separate battle with the State Department, Air India International got an export license for the first of three years. Conditions included for delivery only that new. State Department has control over all license for roundtrips, which includes export, and India has into same outside before the license was issued.

Apparently the failure was caused by speculation that India might use the agreement to integrate power to government. China, the State Department said it had nothing to do with the bilateral agreement. The license was issued with the usual restrictions against trade with oil U.S. clients.

Missile Test Expansion

Department of Commerce procurement program has let a new set out of the Air Force by the Air Force. Air Force Procurement Group, a business expansion program to facilitate in testing of weapons round. Recent weapons tests Pallas as four and round intercontinental program will not have been there. Talismans building will be for longer and monthly, round building for monthly.

In addition, there will be new storage facilities for cruise and ballistic, a short retirement and ad disposal system. Supporting these will be an offshore

facility with oil tank, water supply, roads, drainage, toilet and shower facilities.

USAF previously identified that the new plant is designed to let into defense manufacturing programs, but refused further information.

Feeder Certification?

Look for Civil Aerospace Board to do some real sweeping and shift ground on local service certification. Chosen are good that the Board will move toward permanent certification, as at least a third extension of the term, of one or more local service reform. Reason is that the Board will try to find out congressional action which would cut off local from permanent, which the CAAB opposes.

Michael Anderson, chief of staff of a favorable finding in the CAAB local service report to the Senate Intermodal Committee Committee and an improved form of air traffic, is probably the likeliest candidate for Board seats (see page 9).

On-Again, Off-Again

The White House presented an ex-ante on Civil Aerospace Board vacancy when it returned from the committee of House A. Jones, U.S. representative to the International Civil Aviation Organization, which was considered all but an unqualified fact.

Observers figure the local sector leaders had a vote power on the appointment and failed because of Jones, feeling that his appointment wouldn't be in their interest. Jones was in Washington for several days, then left for Montreal and his current job with ICAG. But as that Jones would be appointed to the CAAB and David Ryan, outgoing CAAB member, would go to Inter-park with ICAG.

It appears that whoever gets the appointment gets the CAAB membership, since permanent chairman has been named by the White House for 1997.

New Committee Lineup

Newly elected Sen. Al Franken, a close Nevada political associate of the late Sen. Pat McClellan, one of civil and military aviation's leading sponsors during his long Senate career, has been named to the Senate Commerce Committee. He is expected to participate actively in the committee's consideration of legislation involving the 1978 Civil Aerospace Act.

While waiting little time in making himself known to Civil Aerospace Board after being sworn in as a senator. He appeared in land-off missions supporting the case of U.S. New, for example, in service. United Air Lines, which would be called on to furnish the aircraft, is opposed to it.

Other new majority members on the Commerce Committee are Sen. Fritz Klobuchar of Texas, Sen. Sam Ewell of North Carolina, and Sen. Susan Thompson of South Carolina.

Sen. Mike Manually seems likely to be named that man of an aviation subcommittee of the Commerce Committee. Last year, he expressed opposition to Air Commerce Committee report, which is interpreted as meaning the provision and all small air transport and holding monopolies in international air transport.

—Washington staff

Weapon System Contracting Clarified

AF Tells Primes: Stay in Own Backyard

- Materiel chief says parts makers will be protected.
- USAF warns of police power to enforce policy.

By Claude Wenz

The weapon system concept is not a threat to small business and the Air Force is determined to maintain a "prayer" program of subcontracting work available to small firms, says Lt. Gen. Brent Stinson, USAF Deputy Chief of Staff for Materiel.

Gen. Stinson told Aviation Week he recognizes that many small contractors, those with fewer than 500 employees, fear that prime contractors will make more components and parts than they have been supplying for many years past.

"I feel," he said, "that this concern comes out of a false impression that the weapon system concept allows the weapon system contractor the license to determine whether equipment or components shall be subcontracted or purchased by the weapon system contractor himself."

The weapon system procurement concept, as stated in AFM 70-9, and the Air Force policy for small business, as spelled out in Air Force Procurement In-

struction 51103, do not affect the weapon system contractor in any such role of operation.

"Under the policy of AFM 70-9 the Air Force will rely mostly on direct contracting between the Air Force and the equipment industry for supply of critical equipment to the weapon system contractor."

Gen. Stinson said that under AFM 51103, the USAF contracting officer can make sure that small business gets a bid opportunity to participate, so long as it is consistent with the need to maintain performance.

"The Air Force is greatly concerned that a proper percentage of subcontract work be maintained," the general said.

"Results of recent surveys show there has been no falling off in the percentage of the Air Force dollar going to small companies either in the form of subcontracts from prime contractors or contracts with USAF."

• Air Force must give top priority to the standardization problem in improving weapon system development. This is revealed by numerous the biggest burden in weapon system development.

• It is equally essential that USAF maintain its close contacts with major manufacturers in order to obtain information on the timeliness not to be dependent on manufacturers in Strategic, Tactical and Air Defense in the face of progress by a potential enemy.

• Administration of Air Force Regulation 70-9, the formal statement that procurement will be made under the weapon system concept, is feasible. AFM 70-9 is a guide, but not a rigid rule.

• It is in the interest of national defense to keep conceptual teams of development engineers and production experts intact when they have been exposed by component manufacturers and that have been exposed in the field.

• It is equally important to national defense to keep production facilities restored, along with the skills and talent to make them work.

• R&D Factors—Gen. Stinson believes the ratio of component manufacturers that prime contractors will spend into their fields heavily goes back to the competitive spirit shared in American industry.

"I believe," he said, "that there will always be some dissatisfaction system in its industry in highly competitive in this. The dissatisfaction is acceptable and not always justified. But the competitive condition is good. It should reflect competitiveness and ingenuity that will give us advanced weapons in a reasonable time."

The competitiveness and ingenuity, Gen. Stinson said, is vital to USAF research and development. And R&D, he added, is "the end away" the most important single factor in the future of the Air Force.

• U.S. vs. Russia—"We are doing every thing we can to eliminate the flow of new ideas," he said. "It is essential, and the industry, highly competitive itself, should take satisfaction from the fact that it is helping the Air Force meet its challenges."

"The Air Force is engaged in one of

ment plan to go extremely into the effect of procurement policies on small firms.

The British committee expects to hold hearings on Defense Secretary Charles Wilson's recent procurement directive (Aviation Week/Def. 27, 1978, p. 11). Frustrated by Defense as an agency to strengthen the aviation industry, the director was influenced by the committee's ongoing Republican as sitting up a lot of preferred firms to support the bulk of defense contracts.

The House committee will go into the effect of USAF's weapon system concept on small firms (see p. 11).

► Pending Legislation: The Administration's approach to transportation legislation will be processed to meet specific situations. The President's Cabinet committee has failed to reach agreement on an overall Administration policy resolving the many issues in controversy among the different forms of transportation.

With the departure of Commerce Undersecretary for Transportation Robert Meyer, the Administration is not expected to pass for implementation of the recommendations of the Air Coordinating Committee's report.

Concerning the review of transportation policy by the Cabinet committee, headed by Commerce Secretary Donald Regan, the President observed in his State of the Union message "This is the first time transportation review ever undertaken directly by the entire branch of the government in modern times."

"We are not alone examining some problems facing the various modes of transport. We are also studying closely the interrelationships of aviation and transportation requirements for transportation. Legislation will be recommended."



British Auster Passes Army Field Tests

Auster AOP-58, 3, became phase into the British army, approaches a rough stable air field during recent intensive tests to establish the craft's ability to operate under adverse conditions. A four-leaf tree

caused to correct such policy decisions as we find it.

► Air Law Review: Other aspects of the draft bill for civil aviation include new provisions to restrict civil aviation law.

Chairman Warren Magnuson of the Senate Interstate and Foreign Commerce Committee indicated that his group would continue the process in view of aviation law, started a year ago with hearings on the aviation bill introduced by the late Sen. Pat McCarran.

► Air Transport Act: will pass for consideration to the 1978 Civil Aeronautics Act defining the certificate requirements for irregular operations and charter operations and defining federal jurisdiction over economic and safety aspects of civil aviation.

► Opening Payments: Congress put pressure on Civil Aeronautics Board at the opening days of the session. Airlines reacted.

► Continuation of a special five-man commission to investigate the Board was proposed by Rep. Bill Rosten of New Orleans, continuing the attacks of the Louisiana delegation over the failure to obtain New Orleans-Memphis City service. Chairman Fritz Pritz of the House Interstate and Foreign Commerce Committee told Aviation Week that his own investigation would be a matter for his group to undertake rather than a new committee specifically created for the purpose.

► The Washington state delegation, led by Magnuson, decided to demand re-consideration of the four airlines now serving Alaska from the Northwest. "We will not settle for anything less," he declared.

Local service airlines again this year will launch a drive for permanent certification of the 14 existing carriers.

Last year, the House passed and the Senate Commerce Committee approved, the legislation. Rep. Carl Albert (D, Calif.) was first to introduce a permanent certification bill this session.

Other matters scheduled for this year's session.

► Aviation problem: In this it should be to drop from two years to 1.5 years a gallon. A year, but the President has asked that the higher rate be continued.

► Defense emergency powers: The Administration wants authority to establish priorities and allocations and to provide the expansion of facilities by government loans contained beyond the expiration date (see p. 11).

► Postal service: The Administration wants an independent board created to set postage rates and balance postal deficits with revenue. Although there is strong support for this, Congress always has balked at reconsidering the perspective in the past. Rep. Kenneth St. George has introduced legislation setting up an independent board.

► Government administration: The Commission on the Organization of the Executive Branch, headed by former President Robert Hoover, shortly will start submitting a series of reports. Those of interest to aviation will deal with legal services and procedures, defense contracting policies and procedures, organization of military research activities and military transportation activities.

Bricker Revives Civil Aviation Law Rewrite

Nasheedled and continued economic regulation by Civil Aeronautics Board under legislation introduced by Sen. John Bricker, making Republican and former chairman of the Senate Interstate and Foreign Commerce Committee.

Bricker's bill is the outgrowth of lengthy hearings held last year on a 177-page bill covering civil aviation, law introduced by the late Sen. Pat McCarran, an author of the 1938 CAA Act. It probably will be the basis for hearings this year before the subcommittee on civil aviation.

► Certificate Requirements: Under the Bricker version, large irregular carriers would be required with scheduled airlines in "one carrier" and required to submit certification of CAA procedures. Only operators of aircraft with less than 12,500 lbs. would be exempted from the certificate requirement.

The Board would have one year after enactment to determine which regula-

tion operators to certificate and for what type of operation.

Contract carriers would be required to obtain licenses from CAA and would be subject to Board economic regulation, including maximum rates. At present, there is no economic regulation of this type of carrier.

► Routes, Routes: Other important provisions of the Bricker bill.

► CAA would be required to grant permanent certificates to local service airlines meeting standards of fitness and public convenience within 120 days after enactment.

The measure does not provide for permanent certification of artificial all-cargo airlines, as did legislation approved by the Commerce Committee last year. Since then, the future of the cargo carrier has become debated, with the failure of Sky, Airways and Flying Tiger. Last year, a cargo aircraft.

► All related economic agreements, including an rights with foreign governments, would have to be filed with the Senate within 30 days after negotiations are completed.

► The executive action regarding aircraft permits from airline industry would be limited. Only carrier certified to transport mail, under the Bricker version, would be eligible for subsidies.

The Board would be required to "take into consideration" into plan to foreign air routes in Unimodal Field Union rules in establishing the severe mail rates of U. S. international carriers. The UPO rules are substantially higher than the rates the Board has set for U. S. carriers.

Bricker proposed a complete rewrite of civil aviation law and a new strong organization of the government agencies handling aviation, as proposed in the original McCarran bill.

"After studying the entire record before the committee," Bricker said, he found "no reason to disrupt the air transport industry with a reorganization of the federal agencies dealing with aviation as to replace the Civil Aeronautics Act of 1938 with an entirely new organic act."

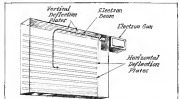
Army Starts Copter Training Program

Training program for Army helicopter units has been started with the addition of two transportation battalions now based at Ft. Sill, Okla., the office of Ft. Riley, Kan.

Army pilots for the two units will receive their wings at Camp Roberts, Ariz. The training program on longer range and transport types of copters at Ft. Sill and Ft. Riley. The Pioneer B-11 is being delivered to the two units.



FLAT PICTURE TUBE, developed by Willy Meier, is key to Navy's rapidly new cockpit instrument display aimed at simplifying flight training. Tube shows a laboratory model.



ELECTRON BEAM, introduced at left, is positioned on the flat tube's screen by applying voltages at a pulse sequence in a series of vertical and horizontal deflection plates.

Flat Tube Will Simplify Cockpits

Navy last week took the wraps off a revolutionary, extremely compact instrument display that uses a radically new flat picture tube (FTV) tube and is expected to cut pilot instrument training time by 75%.

The new flat tube, developed by Willy Meier, Inc. (Aviation Week/Def. 27, 1978, p. 11), and a cockpit mockup of the new integrated instrument display were shown last week to Navy officials in a meeting at Douglas Aircraft Co.'s El Segundo plant.

Sponsored by the Office of Naval Research and Bureau of Aeronautics, the new cockpit display is expected to fly in an experimental aircraft in 1978. Another portion of the same program is aimed at reducing the control system to two bar controls a control stick and a throttle.

Everything on Flat Tube-Information now displayed on a multitude of individual panel instruments is expected to be displayed on two flat picture tubes. **► Visually uncluttered** new cockpit flat

tube, located directly in front of pilot, will display altitude, speed and attitude plus and bank attitude information plus physical terrain features such as mountains—depicted artificially.

The display will be transparent so as not to interfere with the pilot's forward vision during current flight.

► Horizontally mounted flat tube, below the first and just inside the cockpit rim, will present the broad physical features of the earth below in a mirror image—about twice that of a conventional radar map.

This horizontal display also will show compass navigation and traffic control information plus distance to base, fuel remaining and similar data.

Switches will enable the pilot to select and display only the information needed at the time, for such situations as altitude, speed, heading, etc. **► Width:** Under the Navy's new instrument display a wide, possibly by the new flat picture tube, a proprietary development of the Electronic Division

Civil Aircraft Shipments Drop

Civilian aircraft shipments, measured by airframe weight, declined 16% in October from the previous month, the Department of Commerce reports. Combined weight of the 174 planes shipped during October totaled 577,118 lb.

Unfilled orders Oct. 18 for civil planes of 3,000 lb. airframe weight and over amounted to 251.

	October 1954	September 1954	October 1953
Completed aircraft			
By weight of airframe	174	265	181
Less than 3,000 lb.	155	234	136
3,000 lb. and more	19	31	27
By number of planes			
1 to 5 place	157	222	136
More than 5 place	17	33	27
By total hp., all engines			
Up to 250 hp.	145	206	209
400 hp. and more	29	57	27
Total value of completed planes			
(1950 constant)	\$25,400	\$36,542	\$28,467
Aircraft	16,648	26,706	28,256
Less than 3,000 lb.	5,794	4,900	5,054
3,000 lb. and more	11,416	24,906	14,202
Aircraft parts	8,962	18,266	6,750
Total aircraft engines and parts			
(1950 constant)	\$4,669	\$5,521	\$5,468
Aircraft engines	4,641	5,352	5,063
Engine parts	2,826	6,199	7,406

Wilco Motors, wholly owned subsidiary of Kaiser Motors Corp.

It has many other important military (and commercial) applications, including use for air defense and air traffic radar plotting beams.

Although several established electronic-television manufacturers are known to have started development work at the tube, Wilco is the first to develop a working model. Experimental models of the new Wilco tube have been operating for nearly a year in the company's West Coast electronics lab, now located at Palo Alto, Calif., Avionics West has learned. The tube was invented by William B. Asker, director of research at the Wilco lab and formerly with the University of Illinois as its electron lab.

■ **Big Picture**—Wilco has built experimental tubes with a picture area equivalent to a conventional 26-in. TV tube, but thickness is only three inches, compared to a depth of 20 in. for a conventional picture tube.

The company has "taken us here to make the picture extremely large" and for reducing tube thickness, a Wilco spokesman says.

Unlike many flat tube developments, which revolve on an elaborate production line, the Wilco tube employs the broader electron gun area known as a conventional TV picture tube. The electron beam is compressed by powerful focusing action inherent in the

tube's design, giving very high definition and brightness. The tube can operate at 2,000-lb. deflection, considerably better than present commercial TV standards of 525 lines, Wilco's spokesman says.

■ **How It Works**—For competitive and patent reasons, Wilco officials are tight-lipped about full details on the new flat tube principles of operation and construction. However, the company officials have released the following description to AVIATION WEEK.

The tube consists of a phosphor screen sandwiched between two rectangular glass plates. The entire unit is sealed and evacuated. New transparent thin-type phosphors, such as those recently announced by General Electric (Avionics West Dec. 27, 1954, p. 11), enable pilot to look through the tube.

■ **Electronic Deflection**—An electron gun projects a beam along a horizontal edge of the tube (see sketch on p. 17). The electron beam then undulates in a S-shaped region adjacent to a row of vertical deflection plates mounted transversely along the edge of the tube.

By controlling the voltages applied to the vertical deflection plates, the beam can be caused to bend down at any desired position across the tube. The electron beam then flows vertically in another deflection region past a series of horizontal deflection plates.

By applying appropriate voltages to these deflection plates, the electron

beam can be deflected in any desired height, forming the final phosphor screen, indirectly charged to attract the beam. Whenever the beam hits the screen, it causes the familiar blips of light that collectively make up the picture.

Thus by changing the voltages on the horizontal and vertical deflection plates in suitable sequence, the electron beam can be caused to scan the front face of the tube in exactly the same way as a conventional picture tube. The circuitry involved in this sequence switching is considerably complex at present, but Wilco engineers hope to simplify it.

■ **Unassumed Questions**—This brief explanation of the new tube's operation undoubtedly creates certain refinements that Wilco will keep under cover until it has obtained patent protection.

For instance, where a transparent picture tube is required, Wilco says transparent horizontal deflection plates are used but does not discuss their action.

Some observers also speculate that other auxiliary deflection systems may be necessary to provide the required linearity.

—APR

AF to Increase Jets In Reserve, Guard

More jet strength for Air Force Reserve and Air National Guard units is planned in a revision of USAF's long range reserve force program.

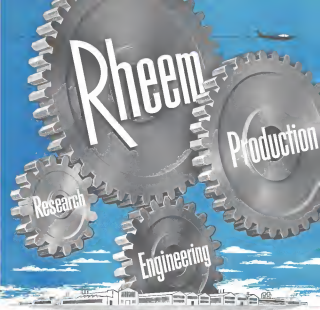
Ultimate goal: 24 combat wings in the Reserve, 17 in the Air Guard. Of the 11 wings, 12 will be jet aircraft—broken down into nine fighter-bomber wings in the Reserve and 11 fighter-receptor wings under National Guard supervision.

This is an increase of one wing for the Air Force Reserve, which now consists of seven transport wings, six fighter-bomber wings, two tactical reconnaissance wings and six training wings. Under the new setup the Reserve will have six, including five new fighter-bomber wings, 18 attack wings and two tactical bomber wings.

The Air National Guard, already at 17 wing strength, now has 15 fighter-bomber wings, six fighter-receptor wings, two tactical reconnaissance wings and two light bombardment wings. Putnam says it is to raise the security to 23 fighter-receptor wings, supported by two tactical bomber wings and two tactical reconnaissance wings.

Both branches of the service also will have increased support units.

Present total aircraft strength of the Reserve is about 630 planes of all types. The Air Guard has about 3,500, most of them a third jet-powered. Putnam says it is for the Reserve and 2,700 for the National Guard.



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AVIATION EXPERTS FROM AROUND THE WORLD SEE GILFILLAN GCA QUORADAR DEMONSTRATED



Representatives of the Royal Canadian Air Force, the Royal Australian Air Force and the United States Air Force were among the many groups attending the field demonstration of the new Gilfillan GCA Quoradar during Winterfest, December, 1953. Also attending was the personnel of the projected equipment

during this period were representatives from the French Air Force, the Spanish Air Force, the International Civil Aviation Organization, representing 81 countries, all Commanders of the United States Air Force, United States Army, Air Corps, Radar and CNO, and the Civil Aeronautics Administration.

Over 200 aviation authorities attending the recent field tests agree the Gilfillan GCA Quoradar meets their full-scale predictions of reasonable reliability. Amongst most commendable was the close demonstration that the new 6-in-1 equipment enables a single operator to handle multiple aircraft in a complex traffic pattern including emergency landings. Further commendable also included the greatly increased definition and expansion of the precision approach display afforded by the new Beta Scan. And scope developed by Gilfillan, instant rotation of antennas to serve desired runway reoriented to operator's position, built-in circular polarisation, eliminating rain and snow clutter, and with the bright-field display, the operator and checking of jet aircraft at 17,000 feet. The United States Air Force is now completing evaluation tests of the new equipment.



IN PRODUCTION Delivery 10 Months



CRASHWORTHINESS of EBF Dore cable steel passenger from crashing forces of 15-degrees nose-up impact reaching 25 G's. Likewise, crew was killed when plane's nose collapsed.

Aircraft Safety Team Proposes . . .

How to Design for Crash Survival

Aircraft Crash Injury Research specialists have proposed important new standards for designing aircraft structures and seats to increase the chance of walking away from inevitable accidents.

The Air-CIRB investigation team found the design standards is a new history of the crash of a de Havilland Dove twin-engine business plane.

► Realistic Requirements—For the first time, the specialists say, the magnitude and duration of the principal crash load in combination with the duration of the force has been established. With such data, they say engineers can set up realistic requirements for dynamic tests of structures and seats.

A Harvard Handbook, leader of Air-CIRB's team, explains that engineers have been handicapped in designing the crash load factor by a lack of adequate load data, and have relied on flight and landing load requirements, plus experience and intuition. Seat design has been influenced largely by application

of static load tests and the ability of the structure to take the force without failure.

Air-CIRB's experience shows that air mode variations in the effects of static or dynamic loads on aircraft, seat and human structure.

► Recommendations—There are factors the Aviation Crash Injury Research team recommends that engineers account for in designing for crashworthiness.

SEATS AND BELTS

► **These** deceleration-time duration velocity factors for dynamic tests: impact deceleration of 34-50G, impact duration, 640/10 sec.; impact direction, 90 deg. above, below and to the side of the occupant's longitudinal axis, impact velocities, 50-180 mph. Include the mass factor of two (70 lb.) occupants to provide typical kinetic energy.

► **The forward** load factor equal to or exceeding the static load bearing capacity of the safety belt—no minimum.

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Lightweight . . .

60°F temperature

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COMPACT—One inch diameter, with 1 1/2 inch body thickness.

RUGGED—No wirelessly operated switch of 10-40 and operational voltages of 1-100 V.D. at 10-100 Hz. Altitude to 50,000 feet. Ambient temperatures range of -40°F to +100°F.

LIGHT WEIGHT—Only 1.6 ounces (even with mounting interconnects) with lower weight at other temperatures.

Test of performance ratings, under DSEB surveillance, have proved that this relay meets or exceeds the requirements of MIL-81107.

Based on 2,000,000 operations, contacts are rated at 500,000 at 30-30 V.D. at 115 V.A.C., 10 to 100 C°.

Gold-plated relay stack comes from 6 ohms to 10,000 ohms.

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SEAT FAILURE of seat (left) backrest (right) under impact of safe seat attack bolt.



SEAT FAILURE of seat (left) backrest (right) under impact of safe seat attack bolt.

with an first knowledge of direction of impact forces as well as magnitude and velocity, occurred Dec. 9, 1952, at Midway Island (N. Y.) Airport during a solo demonstration flight.

The pilot made a single engine approach to the field with the right propeller feathered. At approximately 38 ft. altitude, two stands down the runway, he started a single-engine "go-around." At 38 ft., the landing gear was retracted, flaps were set at 20 deg.

A few seconds later, during the climbout, the pilot tried to retract the right engine. As the prop began to rotate, the Duce moved up suddenly, stalled and rolled off to the right.

Cutting through small trees, the plane hit soft ground with the nose down about 35 deg. and the right wing down approximately 40 deg. The angle was 38 deg. to the right. The right wingtip struck first, quickly followed by the nose and cockpit. Impact speed was calculated to be about 55 mph.

The right wing's authorized section crumpled and the wing and cockpit collapsed to the right and rearward to the wing center section in the plane hit, bounced and rolled back approximately 180 deg. on its vertical axis. A second and final impact occurred to it but barely on its body and did backward to a halt.



FLODE COLLAPSE popped with fire in her rear ribs. Wall attachment failed.

The pilot and co-pilot suffered fatal injuries; the two passengers, in forward facing seats at the rear of the cabin, sustained only minor bruises. **Crash Loads Handbook** reports that the Duce hit crash impact was approximately 28 deg. to the left and 15 deg. below the plane's longitudinal axis. At the crash, presumably, the fuselage pitched up slightly and the impact force ranged from 15 deg. below the longitudinal axis to 30 deg., dissipating about 54 ft. of the nose structure.

The calculations that the plane decelerated from 55 mph. to about 44 mph. during the first contact, implying a force of 26.2G in the impact portion of the passenger cabin. Andrus indicates that force lasted about 0.013 sec.

After bouncing, the Duce over-rotated, turned 180 deg. and did back wheel to a stop, the left wing was down 510 deg. and the tail moved slightly to the left to veered down the nose. Impact speed was about 20 mph. The crash force here was imposed from the rear, slightly from the left and about 25 deg. below the longitudinal axis of the cabin.

During the second contact, the two rear passengers were failed downward, to the rear and to the side.

Using known static test load data for the seats, and the absence of injury, it is estimated that the second impact generated a force exceeding one or more of these loads: 4.6G downward, 1.6G upward, 1.6G forward, with peak lasting about 0.02 sec. Average longitudinal deceleration during the slide backward was approximately 0.6G for about 14 sec.

Damage—The cabin structure, particularly in the front area, proved to be highly satisfactory, **Handbook**, **Boats** Collapse of the right wing without damaging the cabin structure adjacent to the wing root, also implies a desirable design concept, for any lack of passenger egress down the seats and cabin walls were of a detached nature.

Causes—The winging the wing.

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PIIONEERS IN THE DEVELOPMENT OF PNEUMATIC SYSTEMS FOR AIRCRAFT

age. Handbook implies that the Dove is actually unacceptable crashworthy design in the passenger cabin.

• China's rugged structure, particularly aft of the front spar, protected passengers from fatal crushing squashes.

• Collapse of the right wing without damaging the cabin structure adjacent to the wingroot also indicates desirable design concepts.

• Disintegrated nature of seats and cabin components is indicated by lack of passenger injury.

• Light-weight ductile seats show absence of failure during the initial impact, indicating this type of seat can be designed to take high dynamic forces.

If the engines had stayed attached to the wing root of landing off in the first impact, it is possible that they might have imposed a pathologic moment to the fuselage with subsequently less damage to the nose, possibly saving the crew from fatal injury. However, had they remained attached and the fuel tanks ruptured, there probably would have been fire.

The first row of passenger seats, as accepted, failed during the initial impact due to failure of the wall of tubular track and partial collapse of the belly structure.

The Dove's flooring is a laminated plastic material and seats are rigidly attached to the belly structure. This rigid connection would encourage penetration of seat attachment failure with damage to the belly and also ductile forward crash doors in the passenger spans. Making the floor an independent platform would alleviate these forces, the track says, and dampen crash forces.

Bell's Commercial Copter Sales Up 20%

Bell Aircraft Corp.'s commercial helicopter sales in 1974 climbed 20% above the 1973 record, while total deliveries for aircraft and spare parts increased 37%. Nearly 75% of the total business was with customers outside the U. S. and Canada.

Most of the year's commercial sales was Model 470, three-place aircraft with a 200-hp Franklin 6-cylinder engine. The machines were delivered to 37 commercial and foreign military operators in the year. Of these, 25 took delivery on their first helicopters.

In the United States, Bell helicopters were sold to operators in Cleveland, Seattle, Dallas, Philadelphia, Denver, Fort Worth, Pittsburgh and New Orleans.

Bell of Bell's sales in the year continued to go to U. S. military users. In addition to the HSL tenders for anti-submarine work, the company is developing the XV-15 countermeasure and the XH-13F rescue helicopter.

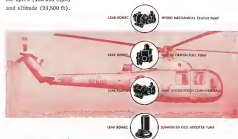
not one...

not two...

not three...but...

four...

Yes, four Lear-Baron pumps help the Sikorsky XH-50 set world's helicopter records for speed (156,000 mph) and altitude (24,500 ft.).



LEAR

LEAR-BARON DIVISION Elgin, Ohio



P5M-2 MARLIN comes head-on to show low-lift and high tail. Production airplane, it is forerunner of Martin's jet-powered XP5M4.

How Martin Tailored P5M to ASW Job

By Irving Stone

Glen L. Martin's P5M Marlin patrol airplane, an anti-submarine warfare type whose long, slender hull is particularly adapted for rough water operation, takes on increasing significance as the forerunner of the company's latest effort in water-based air craft—the XP5M1 SeaMaster. The SeaMaster is a jet-powered transport, just officially announced (Aviation Week Jan 10, p. 16).

For the new P5M family, of course, Martin engineers probably have drawn heavily from design and operational experience with the P5M aircraft, particularly with respect to water handling characteristics. The P5M, then, is a pattern built in a design as its own right and as an indication of Martin's thinking for the future.

► **Production P5M-2.** First production P5M-2, latest of the series, was delivered to the Navy last June. Essentially the same as the P5M-1, the -2 version incorporates a number of design refinements. Among them:

• **T-tail.** Conventional tail of the P5M-1 was changed to a T-configuration in the -2 version. Aerodynamically more efficient, the T-tail requires less area, hence permits reduction in both structural weight and aerodynamic drag. The reduced drag means a considerable slash in fuel weight for a given range.

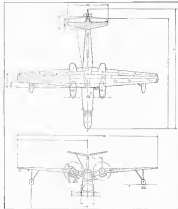
One version of the P5M-2 incorporating the conventional P5M-1 tail had a gross weight of 500 lb more than the



NEWEST P5M-2 MARLIN shows slightly different superstructure arrangement and new tail section compared with



EARLIER P5M-1, which has conventional tail. Can't also use fuel tank capacity because cells in tail center section are smaller.



TWO-VIEW shows lines and dimensions of front and plan aspects of P5M-2 Marlin.

FLY.....or FALL

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Marlin History

Basic design of what is now the P5M-2 began with preliminary design studies started in July 1946, for the 275M-1. First engineering drawing for the first phase was released in March 1947, and manufacturing commenced two months later. First engineering was completed in September 1947. First flight was on May 4, 1948, and flight disintegration completed in January 1949. One month later the second was delivered to the Navy.

Next phase in the series, P5M-1, had its working inspection in October 1949, and preliminary design studies were completed and first engineering drawings released the same month. Manufacturing was started in January 1950, and first engineering was completed in August of that year. First flight of the P5M-2 was on June 21, 1951, and first model was delivered to the Navy in December 1951. The plane is now in service with both the Atlantic and Pacific fleets.

First production model of the P5M-2 was delivered to the Navy on June 29, 1954. The plane now is in more production at the Glenn L. Martin Co.

Full tankage capacity as the -3 version was boosted by 518 gal. (from 1,215 gal. to 2,833 gal.). This provides a total airplane fuel capacity of 3,435 gal., compared to 2,215 gal. for the P5M-1.

This permits extended 2,000-mph sub-sonic missions to be flown with bomb loads for maximum effect.

The increased capacity is obtained by raising the deck level in the tank area and using larger fuel cells.

Other Refinements—More powerful Wright Turbo Compound engines increase the performance of the P5M-2 to make it a more effective ASW weapon. Each of the plane's K1350-12W engines develops 3,450 hp dry and 3,700 hp wet.

The addition of good sea side windows in the aftermost section of the -3 version gives adequate vision sighting facilities.

Other modifications consist of ball balanced changes for fuel supporting systems and relocation or elimination of various hatches.

Structure and broad details of the P5M series are basically similar, hence the following specific details of the P5M-2 apply as well, generally, to the P5M-1.

Ball Makeup—Ball is a semi-monocoque structure. Below the deck, ball bottom consists of plating reinforced by longitudinal stringers. Mainstream speed is about 544 knots. The stringers tie into deep floor frames long



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HYDROFLAPS on hull bottom allow high water maneuverability for PTM

role, for example, stand up above the stall angle, Moles reports.

Instead of uncontrollable stalling while moving below critical flying speed, the craft remains at work a time angle that the large closed elevator gives the pilot complete pitch control, it is said. Thus, the Moles is not subjected to violent, secondary impacts during landings, and reflections in structural loads is avoided. Also, the low trim angles give the additional advantage of its personal service use.

Adequate lateral control, a weather compensation for rough water operation. Spiller action, an adaptation with conventional aircraft, consistent with strong sailing tendencies which may develop during takeoff and landing.

► **Hydroflaps:** The Moles-developed for damage on the PTM serve as the main supports of a landing's unstable nose wheel and body. The installation consists of two hydraulically actuated hinged flaps located on the aft-half between fuselage or nacelle to be in use when on the rubber patch.

Extended individually, the flap segments act as a water rudder. Extended



SHOULDER VS. LONG airbody design show respective behavior in side view.

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REFUELING PSM from they or there can be accomplished at fast rate.

together, they serve as water bucket or sea anchor. A load limiting device at base the hydrofoils to retract enough to prevent damage if they open in excessive amount of high water speeds. Accidental operation in air, up to full instantaneous deflection, produces a negligible trim change, Marlin says.

Also, forward loading can be accomplished with conventional power, thus saving an engine cooling problem.

►Wing—This is a high full cantilever type, employing a center section integral with the hull, two retractable outer panels and tip. Center section forming the gull has a hinged, extendable outer wing has a 5-deg. dihedral.

The wing structure has fuselage support. Gull panel assembly consist of single skin and construction with dual skin elements, except in the center wing between front and center spans, where double skin is used because of the subsonic flow and air coils installed in this location.

Vertical shear strength is afforded basically by these spans running the entire span of the wing.

Rigid ribs at 50 to 150-in. spacing provide bulkhead strength in the wing box, and are located at points where large concentrated loads are introduced into the wing structure. Leading edge of the wing is retractable.

►Spar—Forward, middle and rear structural elements are single spar structure with metal torque box leading edges and fabric-covered ribs control box aft of the spar.

Spar also allows control of angle and spar-to-spar connection construction, with chordwise bracing.

Wing tips are of two-cell box, metal-covered construction with a single spar and ribs at about 7-in. spacing.

►Fuselage—This has a a wing-type structure with three wing-type components. Making it of three and this, with no struts in the bottom. Two main bulkheads for the main and side strut attachment are at wingtip ends, with additional wingtip bulkheads provided at the bow and stern.

Floor bracing consists of a main strut and two side struts, pre-connected to the bow and wing. Main strut has two spans supported by reinforced structural covers, with bearings for struts and side struts are attached to wings with

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2. HIGHEST ACCURACY. Here a Fenwal technician checks Thermocouple for indicated accuracy. This is typical of Fenwal's strict quality control during installation. Through testing and inspection assure dependable performance. Fenwal engineers work closely with military and civilian aircraft technicians in perfect methods of application.



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Solar Skill

This unique nacelle is made possible by Solar's skill with stainless alloys

WHEN NAVY PATROL PLANE hit the runway, the impact will be a rugged construction. So in the Ford Neptune series, Lockheed's designers made a rugged aluminum nacelle with the F1V-5. They called for engine nacelle of stainless steel, to provide greater structural strength with less installed weight than conventional steel nacelle. Weighing only 370 pounds, each nacelle must support a Wright turbo compressor

powerplant weighing over 5000 pounds.

Solar was selected to take on the challenging job of producing these nacelles. It involves precise forging and welding of long-toe full-hard stainless steel in fabricating the intricate wire and rib structure. With more than 500 detail parts, the nacelle assembly required development of many special tools and processes.

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better operation. Doors are removable for warm weather operation.

External protection against ice on the windshield is by an alcohol spray, and against rain and snow spray by the oval windshield wipers. Internal defogging and defrosting is by heated air. Camera installation—A camera is used for change measurement in both dry and night operations. Mounted in a drum head pod, the camera is stored in the after-bell. For camera use, the pod is attached to the outside of the windscreen, opening inward toward both after the plane is airborne.

The camera is designed for pod in diving so that camera attitudes can be made from vertical to 45 deg. aft. For night photography, a flash tube and mounted in a similar pod on the port side hatch provides illumination for good photographs up to attitudes of 300 ft.

The overall arrangement permits camera and flash to be kept clean and free of salt water spray. Pods can be removed and installed from inside the craft at any time, and both units can be left at the base with insulate weight saving for missions where camera will not be required.

Control system is wired to start engine operation from the bomb count capsule. With the master switch on and the day night switch and fuses at proper selection, the camera and flash operation is automatic, providing proper light and photos of each store drop.

Maintenance, Servicing—Almost all engine engine was removed adjustments can be made from a nacelle compartment through a removable forward door. Complete access is by quickly removable cowling in conjunction with special designed engine work platform and lock stretching to upper wing surface.

All cowlings are readily accessible and removable through doors on the upper wing surface.

Simple structure permits loading, porting complete refueling from sky or shore in a few minutes. Ground fueling provisions also are included for both wing and hull tanks.

Basic load and refueling arrangement store system are loadable from top of wing.

Towing provisions are incorporated for shackling from trawlers. A tow-tug provision is provided and a hook fitting the shackling line is located on each wing leading edge outboard of nacelle. A stern towing fitting is used for holding off, and also serves as an attachment for a mooring line during engine warm-up.

Two bertha boat fittings are located on the hull top outboard of the wing line hooking the craft aboard a trailer or dock at a specified gross weight.

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1

Life of F-5 Autopilot Design Stretched as . . .

In: *Physis* Klasse

In the field of fighter-interceptor technology, where obsolescence is a serious occupational hazard because of fast-moving plane speeds and new tactical roles, the Lear F3 has crossed unenviable longevity. Now, by means of a new advanced system called the L-30, developed for supersonic aircraft, Lear expects to extend the useful life of at least F-5 fighters by several years.

There are many advantages to stitching a basic pants design, as Douglas and Lockhead can testify with their basic DC 6 and Constellation patterns. In the case of Lear's L-10, some of these advantages are:

• **Already debugged** Thousands of F-1 components have been produced, de-

logged, and proven in the field. This should spare the L-10 many of the headaches that normally accompany a new engine design.

- **Already cooled:** Much of the power FS cooling can be used, cutting manufacturing costs and enabling the company to offer quicker delivery to a potential customer.

•**F-15 upgrading.** Existing F-15 fighters now in use can be upgraded to 4.5th without too much effort or cost.

- **Maintenance simplified** - Present USAF maintenance personnel, trained on F-35, can be subtasked easily to handle the L-39

► **More Than Autopilot**—The L-10 is most aptly described as an automatic flight control system than as an autopilot. It provides stability increments

tion (charges) by all five asphalt control axes, if required. The L-11 also is designed to be used as a permanent or temporary duplicate of the original and attitude synoptics.

The L-15, like the recently announced Minneapolis-Hercules E-4 (Aviation Week Nov. 1, 1954, p. 69), is in reality a series of building blocks from which aircraft control systems can be tailored for a variety of fighters, interceptors, bombers, or transports, *etc.*

► **Final installations**—The E-10, which has been tested in a Republic F-104, will soon be installed on a North American F-50D and an F-104 for Air Force evaluation.

The F44F now is equipped with an Air Force type MB2 autopilot which

COMPARATIVE ADVANTAGES
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Category	Wolfe Advantage	Union-Pak Advantage
10% LESS	10%	0%
100% AS EFFICIENT	100%	0%
10% SAFER	10%	0%
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10% BETTER	10%	0%

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F-5F AUTOPILOT is now the ME-2, but the L-10 will soon be tried in this place.

might be termed as "L-10" because it has certain features of both the F-5 and the new L-10. When first called in on short notice to supply an autopilot for the F-5F, there was not sufficient time to produce a full L-10. (Less a proof of the fact that it was delivering production ME-2s, these weeks also it speed the solution.)

The ME-2 is slated for test installation soon on a Martin B-57 bomber and on a reconnaissance version of the B-47.

► **L-10/F-5 Differences**—There are some of the basic differences between the L-10 and the older F-5:

- **Display gyro eliminated.** There is considerable duplication of gyroscopes on present-day military aircraft, particularly interceptors. For instance, some interceptors have up to five separate vertical gyros, each used for a separate function, including yaw, roll, heading, flight director, for control computer, autopilot, and radar antenna stabilization. If any one fails, the associated equipment is incapacitated.

In the new L-10, the vertical and directional gyros are eliminated and the system is designed to take its attitude signals from the widely used Low VCE panel horizon indicator, and its heading signals from the widely used type 311 low drift panel indicating heading gyro system, or a low-drift Low cost which Navy BuAer recently contacted to buy.

- **Stable platform achieved.** Low has developed several gyro-stabilized platforms which could serve as a major reference for the L-10 as well as provide signals for panel instruments, fire control and bombing systems. A pair of stable platforms stabilized in air airplane would give complete stability provision, removing overall instability and cutting weight by further elimination of individual gyros. The stable platforms, with its associated gyro-stabilization, also would permit a pilot reference for vertical attitude control.

- **Rate gyros added.** Three rate gyros

have been added to provide stability augmentation for all airplane functions during manual flight and to facilitate the transition with interceptors or bombing fire control systems. The rate gyros are located in the amplifier in the space located by the F-5 vertical and horizon gyros.

- **Higher amplifier gain.** The addition of tachometer (rate) generators to provide signals proportional to rate of turn correct shaft deflections, plus correct design changes, enable the L-10 amplifier to provide 10 times more usable gain than the F-5. Low reports. This results in increased accuracy in positioning control surfaces, an important consideration for stable control at and above sound speed.

- **Match number control.** In addition to barometric altitude control provided in the F-5, the L-10 offers standard mode of operation—automatic Match number control, which equates the plane's altimeter to maintain it at a constant speed.

- **Altitude heading control.** Further to facilitate interceptors fire control system, the L-10 heading control system is introduced into the altimeter instead of the earlier channel in the F-5. The older, taking its signals from a new altimeter sensor mechanism, functions to provide "constant lift" control directed flight during all maneuvers both for interceptors and manual flight.

- **Control stick damping.** The currently popular control stick damping, which enables the pilot to maneuver through the autopilot using the plane's regular control stick for control, is provided. The airplane responds much as it would under manual flight, except that it remains stabilized in its own attitude when the pilot releases the stick. Especially important for low altitude, high-speed maneuvers control stick damping can be provided in stick, or in addition to the standard F-5 type of knob controller.

- **Banking and fire control system.** The

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L-10 is designed to maneuver the airplane in accordance with signals generated by several types of bombing or intercepting fire-control systems.

- **Automatic landing system.** One mode of operation, particularly useful for interception under ground-controlled intercept (GCI) command, enables the pilot to penetrate any defense and acquire landing authorized by GCI.

When he pushes a button, the plane takes up that heading. The pilot can alter the pre-set course, even after he has pushed the button, by action of the auto landing selector.

An alternate mode of operation enables use of an automatic landing feature in the L-10. If a pilot gets laid up on his back while in a turn, he need only push another button and the plane automatically will level out on the next heading it had at the moment the button was pushed.

- **Obstacle-free flying.** The new L-10 navigation complex provides for automatic emergency flying in addition to the usual ILS automatic approach feature.

- **Automatic trim control.** The L-10 provides automatic operation of trim controls to relieve pilot/steering loads on the control surface. If the plane has trim tabs or on the control yoke (if the plane has a boost system). A novel two speed trim servo eliminates the need for some separate trim systems for manual and automatic trimming.

- **Hydraulic servo.** Lee has designed a family of electrically controlled hydraulic servos to handle either parallel or differential-type actuator installations and a variety of power requirements. If hydraulic servos are desired, Westinghouse power can be added; a two-stage valve in use in which an electrohydraulic motor actuates the first stage, which in turn operates a slave valve which controls the flow to the actuator.

The parallel-type actuator has become easier to find the piston automatically in the event of loss of hydraulic pressure. The differential-type actuator has provisions for locking the actuator in event of malfunction.

- **Flammable flame-in appearance.** the L-10 uses amplifier resembles that of the F-15. Small plug-in amplifiers are mounted around the main fuselage in the F-15. Some of the other handling F-15 components truly special in the L-10 include:

- **Powered magnetic clutch servo** with continuously running motor, which combine with the hydraulic amplifier to give fast response.
- **Automatic gas compression,** which checks 14000 psi pressure as a function of engine speed and air density.
- **Automatic cutoff,** which deenergizes autopilot when controlled by manual.

tion that would apply large loads opposite to the servo.

- **Weight Compensation—Integration** of the L-10 with the attitude and directional reference of other systems should enable the new autopilot control to provide its increased functions without appreciable increase in weight over that of the prototype F-15. The plane requires stability augmentation in use or most cases the L-10 actually results in an attractive weight saving, Lee says.

Although system weight grows with the particular installation, the L-10 scheduled to go into the F-107 will weigh 60 lb (estimated) including approach complex, Lee reports.

New Atlantic Net Uses Ground Waves

A big improvement in the reliability of high frequency ground-wave communications is in prospect for airlines flying the North Atlantic route when a new radio network employing ground-wave transmission is completed in the next few months. Six-wave transmitters, partially employed, is frequently interrupted by sea, spots and other natural phenomena.

The new network, conceived by the American World Airways, is expected



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to provide efficient communications more than 95% of the time. The new stations are located at Turkey (Newfoundland), Gander (Ireland) and in the Bahamas.

• **Stated in 1952**—Initial FAA reception of ground-wave transmission began in 1952. A test installation on Long Island confirmed that ground waves suffered relatively little absorption over water, while transmission over ground, if a vertically polarized antenna is used and installed near the water's edge.

In August of last year, in cooperation with the Canadian Department of Transport and Trans-Canada Air Lines, FAA's Paul Ruffalo set up a listening post at Turkey.

Ruffalo found that ground waves up to 400 miles away could be received when a conventional sky-wave station at Gander was off the net or had difficulty receiving the actual transmission. During a five-day period, there were 30 accidents where Gander could not communicate with aircraft as had difficulty in doing so.

With the cooperation of the USAR, which was installed in the project, a ground wave station was installed on Gander. During a two-week test period, the Gander station was turned solid coverage up to 500 miles, even during two days when sky-wave communications were completely blocked out, FAA reports.

Following these tests, the Icelandic and British governments now supported and arrangements were made for the Gander and Helsinki installations. The former is now complete and the latter is nearing completion.

• **Ruffalo** cited in recognition of Ruffalo's work on ground-wave communications, he recently was awarded a citation by the North Atlantic Radio-telegraph Committee (NORLAC) as the man who had contributed most toward the development of radio navigation along the Atlantic route during 1953.

NORLAC operates all the major trans-Atlantic airlines.

Devices Speed Test Of Avionic Units

A high-speed electronic test which can be used to test marine radio-aided groups depending upon their structural construction, is one of several new devices available for production line testing of avionic components.

The new center testing device, Type 125, can check stations from 1 ohm to 10 megohms, at the rate of 7,500/hour. It consists of a Wheatstone bridge and sensitive balance detector with relay output.

The manufacturer, Barnes Development Co., has also announced a detection bridge, Type 338, which can be used to compare the value of a station to a predetermined standard, giving an automatic indication of the percent deviation from the standard. Devco can be set to operate relay at two different deviation values on each side of the nominal value.

Address: 213 W. Baltimore Pike, Lansdowne, Pa.

• **Other new production testing methods**

• **Tube tester**, designed specifically for production testing to MIL-111 Spec Devco, which contains its own regulated power supply and automatic biasing, may also be used for engineering analysis of tube characteristics. Manufacturer: Barnes Research and Development, Lab. 9216 E. Bell Road, Downey, Calif.

• **Rotor accelerometer**, Model T-15A, can be used to subject devices to acceleration of up to 100G. Accelerometer can handle samples which weigh as much as 500 lb. Sixty slippage resistant power and signal voltages to rotating member and test sample. Unit operates from 440V, 60 cycle, 500 watt power. Manufacturer: Schenectady Machine Works, Canastota, N. Y.

• **Digital voltmeter**, Model 519, measures d.c. voltages from 0.001 to 999.99, with automatic error of less than 0.01% on 0.001 volt, whichever is greater. Instrument also reads 75 readings a minute with automatic visual indication of polarity and decimal point position. Manufacturer: Nat'l Instruments, Inc., Box 738, Del Mar, Calif.

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• **For the Threshold-Guard Filter's** Henry Hickey Electronics Equipment department is on the threshold of electronic advancement which will increase further our military defense and aerospace capabilities, according to Dr. W. R. G. Hickey, general manager of GE's Research Division. These advanced electronic capabilities, such as, surveillance radar, height-finding radar, guidance and control mechanisms and communication, will be up.

• **Signal up**. Equipment before evened out, represented by GE's Light Military Electronics Equipment department during 1954 was at the highest level since World War II. Filter department.

• **Name Steps up DME Production**—National Aeronautics Corp. says that it is stepping up production of its model UO-1 distance measuring equipment to two per day.



J. L. ADRIAN, CHIEF PROPPELLER DESIGN ENGINEER, PROPPELLER DIVISION, CURTIS-WRIGHT CORPORATION, CALDWELL, N. J.

G-E aircraft motors meet C-W's toughest specs

"When Curtiss-Wright was developing its now famous Electric Propeller," says J. L. Adrian, Chief Propeller Design Engineer of the company's Propeller Division, "it faced very strict design requirements. For instance, C-W needed a propeller pitch changing motor that would function with precision under the rigors of constant military service—extremes of altitude, temperature, vibration, shock, and centrifugal force.

"Then G-E engineers were called in. They went through with a basic motor design that not only met Curtiss-Wright's toughest specifications but, with variations, has been used in 35 different Curtiss-Wright applications

since—on such planes as the B-50 Superfortresses, C-124 Globemasters, and DC-6, CV-340, and Constellation transports."

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LOCKHEED L-1049 Starliner from which passengers enter plane without leaving seats of transit.

Loadair Dock Goes Into Operation

Cost of experimental Whiting installation at Idlewild is being underwritten for a year by the manufacturer.

By George L. Christies

Recent installation of a Whiting Loadair mechanical airplane docking device at New York International Airport marks the first use of the equipment in the U.S. (Aeronautics Week, Dec. 27, 1954, p. 7). A similar test, in operation for several years at Sotolero Airport, Barroquillo, Colombia, has used Aeronaut 500's in ramp time, according to Whiting.

Idlewild Details—Here are some details about the New York installation at Idlewild.

• **Loadair** tows an aircraft sideways on rollers for a distance of 50 ft. to position it close to the loading dock. This allows

passengers to board or leave the plane without being exposed to inclement weather (did not use dolly with the group and onto an airplane trailer).

• **Installation** was made entirely at the expense of the Whiting Corp. for an approximate total cost of \$60,500 (some \$50,000 went into building structure and installation, \$10,000 into Loadair machinery). The Port of New York Authority gave technical assistance.

• **Responsibility** for upkeep and maintenance was outside with the Whiting company.

• **Dock** is installed at Gate 4, adjacent to American Airlines' facilities where it will be used by AA and other carriers.

• **Equipment** was underwritten by

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with experience in the field of Systems Engineering, Mathematical, Circuit Development, Electromechanical Development, Digital Techniques.

Long-Range Information Transmission

New advancement in the field of long-range information transmission are being made at Hughes with digital techniques.

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Waiting for a not very real hero.
 • Installation took 21 months from ground breaking to completion.
 • Technical Details: Whiting says the treasury dock is designed to house pen-
 angons on large, bicycle landing gear
 planes from the top deck, while pen-
 angons for smaller and tail-wheel air-
 craft board from the ground deck.
 Lower level is also used for baggage re-
 ceivers and ticket check-in prior to board-
 ing aircraft.

A conveyor belt, moving at 150 ft./
 min. takes baggage to and from aircraft.
 Belt is covered to protect baggage from
 the weather.

In operation, an aircraft taxi on to

three dollars which are in the "out"
 position, 90 ft. from the dock. Trade
 for the same gear have been agreed to
 correspond with the airplane's land-
 ing gear track. Nose wheel track is
 positioned for one of nine tracks to cor-
 respond with the wheel base of the
 airplane.

With tail-wheel aircraft, the two
 main gear sets reflect on to the main
 deck and the tail wheel allowed to
 wheel.

As soon as the plane is positioned,
 pins on the tracks are moved to prevent
 nose gear wheels from rolling off the
 deck. A push-button starts an electric
 motor which drives a screw to pull the

plane toward the dock, to the dock
 no less than a quarter. Power is applied
 to main deck only; the nose dolly
 moves freely.

• **Wet Decontamination**—Writing off
 only, in conjunction with American
 Airlines and INSEA, gave a pass per
 year at the Midland London security.

A closing run starts and push up to
 15 mph give compensation a first
 based exposure of how effectively the
 London alone passengers to board an
 aircraft with only a second's exposure
 to the elements as you step from dock
 to plane. And you do not have to walk
 through wading water on the ramp
 to get to the ship.

When plane has moved into from
 the dock, starting and stopping was
 smooth. However, the mechanical
 cable drive due main deck disturbed
 and came off the pulley which is located
 at the far end of the track, causing a
 delay. Also, the heat switches got out
 of adjustment so that the plane did not
 stop where it should have on the return
 trip and had to be repositioned before
 disembarking was possible. However,
 Whiting said these "bugs" will be
 worked out soon.

• **Electrical Operation**—All electrical
 equipment used with the London dock
 is manufactured by the Westinghouse
 Electric Corp.

Among the components supplied by
 Westinghouse are a motor, 18 hp. drive
 motor which operates the tracks to
 move the airplane 90 ft. to 40 sec. at
 an electrical cost of less than 15¢ per
 operation, and three relay-control units,
 which power the baggage con-
 veyor belt at 150 ft./min.

Electrical power from a three-phase
 208 v., 60-c. line supplies the Whiting
 huge elevated control panel through a
 main switch.

Movement of the plane is controlled
 through four push buttons, one at the
 upper platform level, one at the main
 dock, and one at the lower ramp. Relay-
 control buttons move the plane along
 the tracks at 150 ft./min. until it is
 no less than the dock, at which point it
 is "berthed" into position at 10 ft./
 min. movement through an "airlock"
 button.

As plane reaches the dock, a limit
 switch controls the plane's final stop and
 plane stop. Limit switches connected
 directly to the wiring stop the plane in
 the correct "air" position.

One operator is required per pair of
 buttons. If either releases his button, the
 London dock stops, as a safety
 device.

A Whiting spokesman says that the
 Midland London has been handling
 about three aircraft movements a day
 since its inauguration last Dec. 15 and
 has been giving perfect service. Ameri-
 can very passenger reaction has been
 excellent.



Simulator operates over wide range.

Anti-Backout Suit Valve Gives Automatic Regulation

New pressure-regulating valve for
 anti-G suits operates completely auto-
 matically.

The valve takes air from a jet engine
 compressor bleedoff, or other air
 pressure gas source, and automatically
 provides air at the correct pressure as
 dictated by the pilot's anti-G suit to
 prevent blackout during periods of pos-
 sible acceleration.

The valve is designed to maintain
 desired inlet pressures of from 10 to 150
 psi and temperatures from -65 to
 450°F. It can be adjusted for low and
 high increments of pressure.

Alt Products, Inc., 1071 Power Ave.,
 Channahon, Ill.



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 electrical systems—use a line of control
 panels that can be made tailored by
 remote manufacturers to the electrical
 system of any plane and the other a new
 circuit breaker have been developed by
 Jack & Hints, Inc.

• **Four Basic Panels**—The panels have
 been designed to applicable USAF-USA
 spec. as a basis of their flexible lay-
 out can be stripped down to include
 only those components required by a
 particular electrical system. If a man-
 ufacturer prefers a component system to
 the panelized, J&H can furnish control
 and protective components individually.

When a power is available for con-
 trol power, there are two basic panels

One is for single-managed systems
 (isolated), the other is for multi-proces-
 ing (parallel). Both panels will operate
 at the a.c. supply rate.

When it is not available, there are
 two other basic panels: one for isolated
 and one for parallel systems.

Most common panel assembly in-
 volves measuring and protective
 elements as a sub-panel, which in turn
 is shock-mounted on the main panel.
 The assembled panel can be furnished
 for rack, bolt-down or impact-type
 mounting. A plug-in type connector is
 used to connect wiring. A handle can
 be provided at the front and rear panels
 are available as accessories.

• **Circuit Breakers**—Meeting the dimen-
 sional and performance specs of MIL-
 C-1579 and weighing 4 1/2 lb., the new
 circuit breaker, designated Q256, has
 a ballcock safety latch employing the
 "one-center" principle to insure that
 the device will stay locked in release
 shock conditions.

Standard structural contacts obtain
 total arc losses as highly loaded loadings
 for activation. Absence of high-line
 currents and isolated plastic contact
 activation points eliminates wear, J&H
 points out. An inherent relay provides
 a positive anti-arcing circuit, making ad-
 justment of interlock contacts con-
 sidered. Main contacts can be tapered

RESOLVED MOODIANS #2

In making New Year Resolutions, why not start along with

Yvonne from Q4, 57, 118 lbs., brown eyes, brown hair,

DICK TEXAS OF 2047? She has resolved a tip to remember

what she remembered last year
 —volunteer that was a real
 with a woman, who knew?
 With a pilot, this is my
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 longer service. Resolve now
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Alarm Makes Operation Of Tester Near-Automatic

A new signaling and recording at-
tachments for the Sperry Reflectoscope,
used for non-destructive testing, sets
off a record to sound alarm when defects
are detected, making operation virtually
automatic, the manufacturer points out.

With the attachments, the operator
does not have to watch the Reflecto-
scope's cathode ray screen. It is a

tasked to the equipment by two belts
and two interconnecting cables. De-
signated as the Type RA signaling and
recording attachment.
Sperry Products Inc., Danbury,
Conn.

Lightning Arrester Guards Air Communications Gear

Cerco communications gear on com-
mercial and military aircraft is protected
from destructive effects of lightning
arcs by new lightning arresters.

The arrester is a horizontally angled
standoff steel cone to which is attached



OFFICE FULLS RANGE of lightning belts.

a Pyrex glass standoff insulator. A
capacitor in the arrester is series with
the RF transmission line providing a
high frequency impedance to the light-
ning arrester, which therefore acts
as a series filter adjustable spark gap to
prevent arcing to antennas and in the
center of the glass cap. Considers of
the gap may be separated through an
electronic window. When necessary,
the spark gap and other components
may be replaced and the unit reused.

The unit is designed for maximum
RF energy transmission in the 3-24 mc
band. It will not flash or arcing
current up to 50 kv within the head.
Weight of the arrester is 5.5 lb. It is
designed within the arrester's shell, so
will not interfere with.

It is used to be suitable also for
antenna tower installation.
Aurora, Inc., Dept. A, 1101 W.
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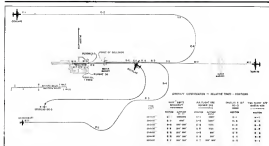


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PROBABLE FLIGHT PATHS of aircraft involved in Fort Lauderdale Airport, prior to collision between Comair and Beechcraft

Official CAB Accident Investigation Report

Tower and Crews Blamed for Collision

THE ACCIDENT

American Airlines Flight 972, a Comair 380, N 9426, on a scheduled flight from Fort Lauderdale, Fla., to Miami, Fla., was involved in a collision with a Beechcraft 1900, N 1900, on a scheduled flight from Fort Lauderdale, Fla., to Miami, Fla., on June 27, 1974, while both aircraft were on final approach to runway 21. The B737 was on final approach, cleared and landed, while the Beechcraft was on final approach, cleared and landed. The collision occurred on the runway, resulting in the death of one person and the injury of two others. The aircraft involved were a Comair 380 and a Beechcraft 1900. The collision occurred on the runway, resulting in the death of one person and the injury of two others. The aircraft involved were a Comair 380 and a Beechcraft 1900.

HISTORY OF THE FLIGHT

American Airlines Flight 972 of June 27, 1974, was a scheduled operation between Memphis, Tenn., and Cleveland, Ohio, with intermediate stops, one of which was Fort Lauderdale, Fla. The crew consisted of Captain J. S. McNeil and First Officer L. G. McNeil. The aircraft was on final approach to runway 21, cleared and landed. The collision occurred on the runway, resulting in the death of one person and the injury of two others. The aircraft involved were a Comair 380 and a Beechcraft 1900.

*All times listed are based on Standard Time and are based on the 14-00 UTC.

Departure from Dayton, Ohio, the scheduled passenger ship approximately prior to Columbus was at 2101 with First Officer McNeil being the aircraft from his right seat position. The aircraft was loaded to a gross weight of 17,000 lb., 2,700 lb. less than the maximum allowable and the load was properly distributed. About 12 minutes after departure Capt. McNeil, per briefing the duties of cockpit, reported to the tower that he was "on speed" and advised he was changing to the Columbus Tower frequency, 121.1 MHz.

At approximately 2207 the flight controller, the tower advised the aircraft was cleared 13 miles west of the airport. The tower then issued a clearance and approved a requested right traffic pattern to Runway 21. The flight at reduced power began a climb descent from its cruising altitude of 5,000 ft. MSL (mean sea level) to 1,500 ft. MSL, then to 1,000 ft. MSL, then to 500 ft. MSL, then to 100 ft. MSL, then to 50 ft. MSL, then to 10 ft. MSL, then to 5 ft. MSL, then to 1 ft. MSL, then to 0 ft. MSL, then to 1 ft. MSL, then to 5 ft. MSL, then to 10 ft. MSL, then to 50 ft. MSL, then to 100 ft. MSL, then to 500 ft. MSL, then to 1,000 ft. MSL, then to 1,500 ft. MSL, then to 5,000 ft. MSL, then to 17,000 lb. gross weight.

First Officer McNeil initiated a descent to 1,500 ft. MSL, then to 1,000 ft. MSL, then to 500 ft. MSL, then to 100 ft. MSL, then to 50 ft. MSL, then to 10 ft. MSL, then to 5 ft. MSL, then to 1 ft. MSL, then to 0 ft. MSL, then to 1 ft. MSL, then to 5 ft. MSL, then to 10 ft. MSL, then to 50 ft. MSL, then to 100 ft. MSL, then to 500 ft. MSL, then to 1,000 ft. MSL, then to 1,500 ft. MSL, then to 5,000 ft. MSL, then to 17,000 lb. gross weight. The tower gave the flight a landing sequence of runway 21 following a TWA 737, which was then making a straight-in approach to Runway 21. In order to establish a normal interval.

before Flight 972, First Officer McNeil extended the descent by and approximately 2101 with First Officer McNeil being the aircraft from his right seat position. The aircraft was loaded to a gross weight of 17,000 lb., 2,700 lb. less than the maximum allowable and the load was properly distributed. About 12 minutes after departure Capt. McNeil, per briefing the duties of cockpit, reported to the tower that he was "on speed" and advised he was changing to the Columbus Tower frequency, 121.1 MHz.

The approach was made in a normal descent and with a continuous reduction of speed. The aircraft reported for the approach was about 2101. When approximately 0.5 mile from the runway and about 100 ft. above the ground the crew felt a violent jar and simultaneous rise of the aircraft to the left. Capt. McNeil took control, noticing the left engine was stopped. Together with First Officer McNeil he continued the aircraft with the nose and banked.

During the landing the Comair nose gear, damaged at impact, collapsed and the aircraft continued approximately 4,500 ft. on its nose and came to a stop before stopping on the runway on a heading of 280 degrees.

Beechcraft Gear collapsed emergency exits at 4,500 ft. MSL, then to 1,500 ft. MSL, then to 500 ft. MSL, then to 100 ft. MSL, then to 50 ft. MSL, then to 10 ft. MSL, then to 5 ft. MSL, then to 1 ft. MSL, then to 0 ft. MSL, then to 1 ft. MSL, then to 5 ft. MSL, then to 10 ft. MSL, then to 50 ft. MSL, then to 100 ft. MSL, then to 500 ft. MSL, then to 1,000 ft. MSL, then to 1,500 ft. MSL, then to 5,000 ft. MSL, then to 17,000 lb. gross weight. The tower gave the flight a landing sequence of runway 21 following a TWA 737, which was then making a straight-in approach to Runway 21. In order to establish a normal interval.

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and slanting wing outward from the aircraft, then penetrating the seat to be used for passenger evacuation. Stronach Gurn pulled the emergency rope from its location above the rear service door and dropped it through the opening.

Evacuation was then carried out with 26 passengers using the emergency rope, two did not exit and 37 the forward passenger door. The raft was dropped through the rear service door into the state of a parachute on the ground. The evacuation was accomplished in an expedition and without mishap with only minor injuries resulting to 14 passengers and the two who were injured were taken to their beds while being flown to the main camp. The emergency evacuation slide, located on the side of the rear service door, was not utilized.

Two small inflatable kits, one located at the rear wheel well and one in the forward baggage compartment, were quickly inflated in great emergency and stored for later personnel before the aircraft had landed the runway and on the scene immediately.

The afternoon of the same day a Navy P-4B 17774, a F4U Corsair, was dispatched from the Port Chapin Naval Air Station in accordance with Naval training procedures to be flown to Nashville, Ohio, West Lafayette, Ind., and other. The flight departed at 1700 under a VFR (visual flight rules) flight plan and arrived at Nashville at 1752 when one passenger was discharged. The flight continued to West Lafayette where it landed safely at approximately 1800. The flight for this segment, left the flight.

With LtCol J. R. Thorne in pilot, and LtCol D. Edgar as observer, Navy 17772 departed West Lafayette at 2000 for the return flight. The flight occurred about 170 hours condensed out of approximately 700, when over downtown Columbus, it called the tower for landing instructions using frequency 142.75 mhz. The tower advised the flight to use Runway 25. Shortly thereafter the SNR requested and was granted permission to use Runway 25 subject to traffic. Navy 1772 was observed by the tower controller to make the downwind leg of a left traffic pattern for Runway 25 and was then sighted on base leg for that runway about 1 mile southeast of the tower. The SNR was then advised by the tower controller to follow TWA Flight 577 on Runway 25 to make one mile out of the field. The SNR turned right, reported it was on downwind for Runway 25. It later reported on base leg for that runway and was then advised by the tower to approach.

The SNR and Corsair were seen three miles west about 1 mile out of the airport on final approach to Runway 25, which time they approached the controller to be clear to make either but with the SNR apparently in the right, to the east and below the Corsair. The SNR was instructed to make a 180 to circle the airport. The leading gear of the SNR was seen to retract and it appeared to be in a shallow left turn just before the collision.

INVESTIGATION

The investigation and subsequent logging revealed that at the time of the collision there were three controllers on duty in

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for them. A fourth man, a CAA trained air operations specialist from the New York regional office, was in the tower for the purpose of having his local contact point but had no direct duties. The engine controllers reported at 10:08 km a second blade stall.

Load control, light duty, and ground control were assumed in primary position and under machine procedures they were rotated about every two hours. The local controller had assumed that position approximately 45 minutes before the accident.

Under procedures for the control of air traffic the local controller is responsible, among other things, for the issuance of clearance and information to pilots of aircraft for the purpose of preventing collisions between aircraft in the traffic pattern.

The Fort Lauderdale Airport served the frequent operations of the Naval Air Station located on the left, commercial operations and North American Vantage production test flights, as well as business and private flying. The tower personnel were directly required to control some types of aircraft and regularly appeared several types of traffic patterns such as overhead, left, right, and straight-in as permitted by Civil Air Regulations. The personnel on duty were well qualified and thoroughly experienced in this situation. During the critical accident period the tower local controller was busy with ground and air traffic, during the period he made 17 transmissions and received about 47 replies from aircraft at various 5 minutes before the collision.

The tower was located in the southeast corner of the airport and the runway was to the north, as shown in sketch, page 79. Several qualified witnesses stated that the tower was considered adequately adequate. They stated it was adequately maintained as a weather observation tower and was not as high as desirable.

The wireless control of approximately 140 small planes of all types follows the tower rule. These very light aircraft make constant report messages equally spaced around the airport flight pattern and one large solid cylinder tower at the north end. A radio installation provided with a camera that had been added to the tower several months before the accident. These conditions increased the local controller, whose position had north to south and more frequently made wrong report traffic. At the time of the accident a new tower was being constructed.

Investigation revealed that transmissions to the Aviation Flight were conducted on 115.1 mc and to the New York on 115.74 mc, both VHF (very high frequency). Jet traffic tested on 127.5 mc, VHF (very high frequency). The local controller transmitted simultaneously on these frequencies thereby making the subject aware to him of transmissions from the tower.

The American and SNA news, however, transmitted on different frequencies to the tower and were thus unable to hear one another. The communications arrangement required the local controller to advise being alerted using USB because

the AWP Manual, "Procedures for the Control of Air Traffic," Part 2.2.

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AVIATION WEEK, January 11, 1963

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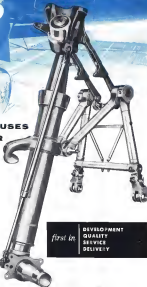
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spring for the Navy flight to land after the TWA aircraft before American 571 became 172 and was not visible until the tower on its right pattern downward leg.

The controller stated he expected and planned for the SNE to follow TWA from the observed position rather than from right and, similarly, to descend 30 ft for Runway 27. He observed that the SNE, about 500 ft above the ground, came right about 10 degrees for the downward leg. The controller did not observe the downward flight of his instructions given the SNE to follow TWA because he stated it was then obscured by the tower. The SNE, flight about 11 miles east of the threshold, did drop to land.

The SNE flight then reported that it was on base leg for Runway 27. The controller was unable to locate it visually although other tower personnel helped at his request. He advised the tower to continue its approach. The controller stated that at this time he was unable to revive the existing separation because the SNE was not in sight.

Shortly after the SNE's base leg report the Corvus was observed in under a right turn to the north for its base leg. At this time the controller stated he did not observe advisory information to controllers to reflect aircraft altitudes by tower. By radio report, the SNE was on base leg and the Corvus, by visual observation, was on base leg. He stated that he did not receive the existing separation at this time, again because the Navy aircraft was not in sight and he felt first by allowing other aircraft's position with instructions might create a hazard. At this time the controller did not ask the SNE for its position or ask the Corvus if it had the SNE in sight but initial missed base instructions to attempt to see the report.

The controller then observed the SNE on a final approach about 210 ft above ground, and approximately 2 miles east of Runway 27. At the same time it appeared to him to be below, in the right, and to land the Corvus. It was made the following transmission, "Navy Seven Seven Three, I have two aircraft on the final approach to American Corvus high and 400 ft above to be slightly behind and to the right of this course." The witness stated the "Navy crew transmitted, 'Begin for landing level I have now in sight, shall I go around?'"

The controller then said, "Navy Seven Seven Three alternative under a 360 to enter a circle at the field and follow the American Corvus." The controller stated the SNE appeared to be sufficiently behind the Corvus that collision did not seem imminent. He then observed the American flight to land and saw the SNE's landing gear arrest. The witness believed 20 to 25 seconds passed between the ending of this transmission and the second collision which followed.

The investigation continued an extensive search for circumstances to the accident along the basic search during descent approach and over these details. The witness observed the accident from the same position. Two hours before the first group, was located about 1 mile east of the runway threshold. They are both on credit during the last portion of their time

note the final approach. They stated the Navy plane was ahead of and lower than the SNE.

Those of the second group were of two hours varying between 1 and 24 miles to north east of the runway threshold. Several of this group saw the aircraft pass nearly overhead on the final approach and at that time noted the SNE below the Corvus and slightly to its right. These witnesses were in conflict as to which aircraft was ahead, however, the majority stated the SNE was ahead.

The third group was located near the east end of Runway 27. The group was mainly composed of air crews who were on ground waiting to taxi or taxi off and who saw the aircraft which collided among nearly directly toward them. When these

two aircraft were first seen these observers stated that the Corvus was 200 to 300 ft above the SNE and that the SNE appeared to be to the right and behind, several of these witnesses saw the landing gear of both aircraft extended. They gave the SNE gear arrest, the aircraft climb slightly, kept a left turn, with the SNE and the Corvus following immediately thereafter.

The last group of witnesses was located in or near the towers. They were in accord that when first sighted the Navy aircraft was lower than the Corvus, it followed approximately 2 miles east of the runway on approach, and was 100 to 400 ft below the Corvus. The SNE flew nearly straight out toward while the Corvus descended gradually. These persons stated that the SNE appeared well behind and slightly

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to the night of the American flight. Several witnesses from all positions observed that the Canaveral position and surveillance (a red flashing light located on top of the control building) lights were on, however some noticed whether or not the SNB's position lights were on.

In the course of investigations since an accurate position lamp was recovered from the SNB, one from the backup position and two from the left light unit. These lamps were sent to the National Bureau of Standards to determine if the lights were on or off at the time of the accident. All Standards were found to be consistent. The backup lamp, a 24-watt type, indicated that at least one of the Standards failed with voltage applied to it. However, it could not be determined whether failure occurred during the accident or at some other time prior to the accident.

The other Standard and the left unit from the left lamp presented an inconclusive outcome regarding whether or not these lights were on or off at the time of the flight. As a result it could not be determined from the laboratory examination whether or not the SNB lights were on or off at the time of the night collision.

The TWA crew stated that at the time the SNB was indicated to make a three turn or go around they had just landed and saw the collision immediately after clearing the runway.

The witnesses were stated that while in the Port Columbia traffic pattern they were aware that an SNB was being contacted as approach traffic. They believed it was going to land on Runway 30 and did not know it had been changed to Runway 27. The crew indicated that they were told of this signal apparent fifteen minutes before SNB contacted a controller. They stated that they maintained a visual lookout for the SNB was never seen.

The official weather report at the time of the accident was: scattered clouds at 2000 ft, visibility 10 miles and north at 6 mph. Official current was 2000, 10 minutes before the accident.

The accident occurred during twilight when the sun was between the horizon and a rapid transition was taking place between daylight and darkness. Witnesses stated at first witnesses at the meeting recalled time taken to 15 miles. At points which were being at the time speed that visual detection was decreasing with increasing darkness and that it was becoming increasingly difficult to see objects from above. The trailing light above the horizon provided similar being above it to be made into all directions but some what easier in the western quadrant.

The most significant of the many in-flight report markings was a series of four parallel cuts in the left wing of the SNB. The structural integrity of the wing was not affected by the cuts to cause the left wing either prior to or after the flight. This portion of the wing was found out at the main wreckage area. The cuts were ground forward from the left wing trailing edge across the left engine nacelle section.

Study of the individual cuts disclosed that in each case the cut was made almost in overhead with downward slant. One cut was perpendicular to the fuselage. The other two cuts were at an angle of 45 degrees to the fuselage.

Visual indications at the start of the cuts and upward directional indications of the cut were made. Further study revealed the cuts were made by the left Canaveral position while it was parking, located over the wing. The pattern of the paper for damage indicated that the overall shock loads laterally and vertically, both close to zero at small scale impact.

The Canaveral wing gear lock was indicated by many studies in a normal direction. Although not conclusive, it does indicated the nose gear had struck the SNB in the area of the right wing trailing section and right wing center section and right nacelle. Cuts made and appearance on the inboard and rim of the left Canaveral wing wheel appeared to have been subjected to a glancing blow. The SNB right nacelle, a tip of which was found out of the wreckage area.

Although the SNB reported an adequate control comparison was made to controls of any standard or mechanical failure as stated prior to the collision. From the damaged components there was an evidence found to indicate that structural or mechanical failure occurred prior to impact. The American crew indicated that the Canaveral was operating normally prior to impact.

The investigation included a careful study of the flight paths and position of the four primary airports which were being in the Port Columbia traffic pattern during the accident period. These factors together with witness testimony were incorporated into an engineering study (p. 76) and indicate the probable flight paths of the aircraft which collided, as well as the TWA Martin and the Douglas DC-3 which provided them.

Considering all available data and the probable flight paths a study was made to determine to the extent possible the exact time of impact was made. Although the impact structure of the Canaveral and SNB. The tests were applied to each air module throughout the test but no attempt to fit flight paths at consideration of the aircraft structure.

It was found that the SNB left past the collision impact point of vision.



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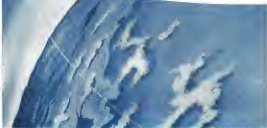
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for the Gemini engine when the Gemini was on the test rig. At this time the SNE was approximately 40 degrees to the right of the Gemini's longitudinal axis and was about 1 mile away. The SNE remained within the visual limits of the captain's position until lock aircraft was on the final approach and the Gemini was approximately 1 mile behind the Navy search. The test time that the SNE was in the visual limits of the captain's position was approximately 14 minutes. At the start of this period the SNE should take the horizon and then maintain below it for the remaining time.

The SNE first entered the visual limits afforded from the seat of the Gemini first officer shortly after he had begun the turn from the downward leg onto the base leg.

When the turn was begun the SNE was approximately 90 degrees to the right of the Gemini's longitudinal axis and was about 51 miles away. The SNE remained within visual limits of the first officer's position except when momentarily obscured by the Gemini was approximately 3 miles behind the SNE on the final approach. The total time during which the SNE was within the visual limits was about 44 minutes. At the beginning of this period the SNE should take the horizon and then maintain below it for the remaining time.

The Gemini first entered the visual limits afforded by the SNE's radar screen from the pilot's position immediately after the SNE started to turn from the downward leg onto the base leg for Runway 27. At this time the Gemini was approximately 1 mile away at an angle of approximately 20 degrees to the left of the SNE's longitudinal axis. The Gemini remained within the pilot's visual limits above the horizon approximately 15 seconds except when momentarily obscured by a windfield barrier. At the end of the base the Gemini was about 50 degrees to the right and was approximately 2 miles away and the SNE had progressed to end was on the base leg.

The Gemini first entered the visual limits afforded from the observer's seat immediately prior to the start of the turn onto the base leg. At this time the Gemini was approximately 70 degrees to the left and was about 51 miles away. The Gemini remained above the horizon from the position and was within the visual limits of the observer approximately 8 minutes except when obscured by two wind shear barriers and upper cockpit structure for about 13 seconds. At the end of this time the Gemini was approximately 90 degrees to the right and was about 1 mile away. The SNE was then on the base leg at which time the opportunity to see the Gemini terminated as the Gemini was obscured by the SNE's cockpit structure and was behind the crew's visual limits. The 15-second period during which the Gemini was within the cockpit visual limits occurred nearly simultaneously for both crew members.

Three days after the accident, it reportedly the same hour of day as the two crew search operations flight tests were conducted. These tests were made using an R4D (DC-4) and an SNE flying in ground proximity with the SNE making 15 passes, according to parameters, relative to the R4D. The R4D was used



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viet hope than the Corsair 240.

Qualified ground observers stationed in the tower and on the airport perimeter, using their experience of the aircraft's previous behavior by one method while they were on the final approach. Although the SNB changed its position, including being ahead of the SNB, the observers also noted that the Corsair was in line of the aircraft gave the illusion that the Corsair was always behind. As the aircraft flew closer toward the runway the conflict actually appeared to also overtake the target.

ANALYSIS

It should be recognized that the only saving study of all the available evidence, "The Incident Flight Paths," contains certain conclusions. These variables which include distance, distance and approach were usually considered and the flight paths as shown on the aerial camera measurements with the physical evidence and testimony.

In determining whether or not the crew of the two aircraft should have observed the other, several other factors must be considered. The first is the angular limits of cockpit vision. This factor is the opportunity to see an object afforded by the physical cockpit structure only. A second factor is visual range. This is the maximum distance at which an object can be seen. This distance is influenced by variables such as the clarity of the air, the size and shape of the object, the lighting and atmospheric visibility.

Finally, the physiological factors affecting the ability of a human being to see an object must be considered. It can be expected a person may not see an object while it is within the angular limits of his sighting or field of vision, 1 to 2 degrees wide. An object will also be seen through the peripheral portion of the eye if there is a sufficient movement or contrast, otherwise it is necessary to search for the object.

As shown by investigation the SNB crew's opportunity to observe the Corsair ended while the SNB was moving from the downward leg onto the base leg and on a portion of the base leg. This opportunity existed nearly continuously for the crew because and lasted approximately 15 seconds during which the Corsair was high on the runway for both the pilot and the observer. During this time, however, the SNB crew looked in the direction of the Corsair, then on the base leg, they should have seen both the Corsair's anti-collision light and the aircraft itself which was clearly visible above the horizon under the excellent field conditions. During the last part of base leg the opportunity to see the Corsair terminated and it was not possible again to see it.

From only the viewpoint of cockpit angular limits of vision the Corsair crew was not in position to see the Navy aircraft when the Corsair was turning onto the base leg. In regard to the cockpit, the SNB remained within visual limits from that time until the Corsair was on final approach of view approximately 1 mile behind the SNB. The Navy aircraft remained within the visual limits of the first officer's position through out this period and until the Corsair was approximately 1 mile behind the SNB on the final approach.

While the SNB turned onto the base

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by and fire onto the final approach if demanded until it was approximately 250 ft. above the ground and when fast turn by maneuvers, or final approach, it was estimated to be at least 200 ft.

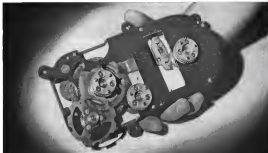
While the American flight was on its last leg, considering the tactics involving visual range (forward visibility limits, the dark terminal background, the fading light condition, the sea and the view presented by the SNE), it is considered probable that the SNE, which was before the horizon could have been seen from above by the Corsair crew.

When on the first approach had the Corsair crew seemed about within the cockpit would inside the target presented by the SNE was within their field of vision. Although during the last part of the Corsair



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head approach the SNE was less, against a poor background, and with little reliance on time or distance to adjust the intensity of the Comstar beam, it was also within visual range and could have been seen by the Comstar crew under the existing conditions.

During the period when the flights which collided were being flown in the Fort Collins test pattern, all transmitters made from the tower to these were "omnidirectional" and not directional as all transmitters were then in use. This arrangement avoided the danger of both aircraft to lose all transmission from the tower.

Although many witnesses transmitters were made out only the transmitters from the tower could be heard, it is difficult to understand why the conflicting approach sequence, both to approach behind TWA Flight 177, was not heard by either party. The conflicting approach transmitters were not heard by each flight and directly affected their path approach. Had both crews maintained radio vigilance the conflicting transmitters could have been detected and an immediate diversion required. It is also difficult to understand why the Americans over did not suspect from the tower the position of the SNE when they were making the first contact and were unable to locate it.

It will be recalled that when the SNE reported on the line by the Kansas 13 the tower controller cleared the flight approach runway 2 miles southeast of the tower. The controller advised that he could not locate the SNE approach in Kansas 13 cleared it to follow the TWA flight on Runway 27 or take the field. This traffic control clearance was given without advising Americans of the clearing of sequence which was also number 2 to lead after the TWA flight. The controller later said the SNE was going to continue in Kansas 27 and not circle. This situation contained in even confirmed that both aircraft were seen as head approach. Both aircraft were ahead to take the same approach from opposite sides of the traffic pattern into a common approach path to the same runway.

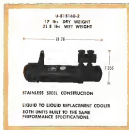
The controller stated that the SNE did not follow his instructions to be heard (planned). Instead of following TWA 177 from its observed position it turned right, established a descending leg for Runway 27, in planning its spacing behind TWA, it followed the SNE were actually back the other side of the obstacle in a corner cleared. The spacing which cleared behind TWA on final approach was correct. If the SNE's action was not in accord with the controller's planning there was sufficient opportunity to make other instructions to the SNE and to study the sequence between it and American 512. A coordinating sequence should either have been given initially or the conflicting sequence should have been clearly the controller's intent, cleared the TWA flight and cleared it to land.

The SNE then reported that it was on base leg for Runway 27 but the tower personnel were unable to see it. At this time the controller cleared it to continue its approach without clearing, in position or spacing of that was not in sight. The advisory information was given when the tower was not clearly identified in base only in base leg although the controller knew the



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Robert W. Martin, Jr.

AIR TRANSPORT

Swissair Bids for Bigger Atlantic Slice

- Carrier to use DC-7Cs for trans-ocean routes.
- And it likes its 240s; 'no hurry on turboprops.'

By William J. Grogan

Zurich—With two Douglas DC-7Cs on order for delivery at the end of 1966, Swiss Air Lines is preparing a serious challenge to its larger competitors for both first-class and tourist traffic on the trans-Atlantic routes.

Swiss considers the North Atlantic run the most important in its system, which also serves Europe and the Near East. To bolster its service on that route, the airline therefore decided to add higher performance equipment.

"We chose the 7C over the Super Constellation because we believe it definitely is a better airplane for our needs," says Heinz Haas, secretary general of the airline. "Also, because we already have an interest in Douglas first."

• **Turboprop Interest**—Swiss operates six DC-6Bs, three DC-4s, 15 DC-1s and seven Constellation 240s. The Swiss carrier's DC-7C order was placed before the presentation of Lockheed Aircraft Corp.'s L-1400 turboprop Super Constellation.

"We are interested in turboprop," says Haas. "But we are not as 'hungry' as some have indicated. The Constellation 240 nicely suited to its European routes. "We do not need the added range which the 140 would provide," says Haas.

• **Two-Class Flights**—Although Swissair had three tourists in winter as well as summer, the airline still finds its intercontinental traffic less subject to seasonal peaks and hopes to build increased traffic among businessmen.

Swissair takes one way to do this is to promote the two-class system as its international flights.

"To judge from the first results of revised class flights in Europe, it would appear that the introduction of standard service was too radical, in that almost everywhere first-class flights were eliminated," the airline says.

Not only businessmen, but also a considerable number of travelers who use air transportation for vacation purposes still prefer the comforts of first class accommodations, the airline points out, adding:



SWISSAIR DC-6B is one of six owned by airline. Two DC-7Cs will be received in 1966.



MAINTENANCE BASE at Kloten Airport, near Zurich. Engine shops are new installations.

however. This is a company devoted to the study of helicopter performance.

The carrier has installed the Constellation 240 strictly suited to its European routes.

"We do not need the added range which the 140 would provide," says Haas.

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"Consequently, a combination of first-class accommodations in the more expensive with high density, low kilometer hour-mile facilities has been indicated."

• **Although Helicopters**—These small flights have been very successful, the carrier reports.

At the outset of tourist season, Swissair leased the capacity of its flights to high-density tourist, with few first-class flights scheduled. Emphasis in the future will be more on island flights.

As the national carrier of a country which attracts large numbers of vacationers, Swissair has found that tourist traffic presents some headaches to a carrier.

"From the point of view of open towns, certain difficulties are magnified," says the airline. "The passenger planning his trip with an eye toward driving the most pleasure from his flight shares certain problems with regard to the time he chooses to fly."

Flight schedules must therefore be adapted to suit this demand, resulting not only in great variations in work

load throughout the year, but also requiring peak performance on certain days at certain hours while at other times it is quite light.

► **Traffic Swarms.** "We are paying no effort in our attempts to distribute traffic more evenly throughout the day and night," a spokesman says.

In addition, frequent travel is more dependent than business travel on air-traffic, weather and other variable conditions.

"If business businessmen are obliged to arrange their trips to fit the business as it is, the government is subject to no such restrictions and, consequently, is free to purchase its top, employ other means of transportation or travel has certain plus factors," says the airline.

"One variable, undesirable business travel, or unusual political conditions may cause him to drop his plans. The result, then, in this case, is not to be regarded as an absolutely stable environment."

Despite the difficulties, however, Swissair has found its travel class some a successful operation.

"What we seek is not lower fares, but some business," says one official of the airline.

► **Rebasing Costs.** Home base for Swissair is at the magnificent air terminal at Zurich, one of the world's best airports. A new engine overhaul facility, now in operation at the Swissair maintenance center, is built to handle 300 engines a year. It has been estimated that it can be expanded on all sides.

Swissair has succeeded in reducing costs considerably by reducing the re-

lease time of engines and propellers as well as lengthening the interval between overhauls, all within an adequate safety margin. To arrange overhaul operations, the progressive maintenance system is used.

Swissair is prepared for a load shift for expansion in the international field, but a condition of holding its place as a recognized trans-Atlantic carrier.

"Entering this field at a late date and as a small carrier, Swissair cannot expect to be welcomed with open arms in such highly competitive markets," the airline says. "Our nation, nevertheless, is far from hapless. Thanks to her central location, Switzerland has desirable assets to offer."

"Of these, the low direct gross revenue and, therefore, the high cost in demanding, new, appropriate reciprocity for Swissair. To an increasing extent Switzerland must consider an transport policy in trade policy. It is refusing to act that Bern probably speaks itself loudly behind us at this matter, and with faith in the development of air transportation, we take an optimistic view of the future."

CAL-Pioneer Merger Foes Reopen Battle

Renault Airways and Central Airlines have asked Civil Aeronautics Board to reconsider its earlier approving a Continental-Pioneer Air Lines merger (ENR/Nov. 22, 1974, p. 104).

Both protesting carriers say the Board is breaking down its historic policy of maintaining the separate in-

tegrity of trunk and local service operations.

► **Bank On.** Renault observes that CAB discusses its decision in its opinions on policy, not in its rulings. In its petition, Renault says "It is contended that there may be exceptions to my policy. However, it must also be recognized that a policy can eventually be destroyed by the process of granting exceptions to it."

The airline also complains that the Board backed off its exception to the common carrier without sufficient explanation in its opinion, in violation of the Administrative Procedure Act. Among other things, Renault questioned the service improvement that is supposed to result from the merger and raised the question of diversion from its own hub to when Continental began to compete under new conditions.

"Continued will not be satisfied to operate Pioneer's routes subject to the restrictions generally applicable thereto," the petition says. "Renault knows, as the Board should, that eventually Continental will seek to have these restrictions lifted and to have its routes consolidated with those of Pioneer so as to obtain the maximum flexibility of operation and to obtain access on a competitive basis to practically all passenger markets in the Southwest."

► **Transfer Problem.** Renault also raises the legal question of whether Pioneer can transfer its present operating authority to Continental. CAB's certificate expired Sept. 30, 1974, but the local service airline had applied for renewal. Under the law, the transfer was authorized to continue to operate until the Board acted on the renewal application.

Renault holds that the expired certificate continues in effect "only in the hands of the person who holds the certificate on its expiration date and only for the purpose of continued operation by that holder."

"The Board also is asked to consider the extent to which the merger 'will delay, if not completely eliminate, the possibility of eventual integration of Renault and Continental.'"

► **General Felties.** Central Airlines asks CAB to reconsider its action because:

- The proposal is not consistent with Board policy on separation of trunk and local lines, "which constitutes the cornerstone of the local service requirement in which Central is participating."
- No substantial improvement in economy or service will result.
- Pioneer now longer has an operating authority if one will to Continental.

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British European Airways has bought two de Havilland Heron Mk. 1 airplanes for service with its air ambulance unit in Geneva.

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Chicago on the return trip. Northwest headquarters under the flight during the winter. Eastern's busy season; EAL Super Constables are used in the summer during NWA's busy time. Plans are underway to increase daily flight frequencies and spring and to add intermediate stops to the Minneapolis-St. Paul and Miami schedules.

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Airline all-cargo service, but generally ruling is that granting a certificate to a foreign airline which does not have an airplane is hardly the answer to the question.

Anglo-German Route—Miami. While Seaboard went, American Airlines' parent company has added another service to its European schedule. As of last week, the carrier was making weekly connecting cargo flights between Los Angeles and Frankfurt.

Equipment for the new service consists of converted Vikings and C-46 Dakotas.

The company reports that the Anglo-German service will connect with other services at London Airport so that "breakfast freight" can be accepted for next day's dispatch.

Lee Calls Route Ruling Move to Kill Feeders

Strong objections to a Civil Aeronautics Board decision to ban local service Route 196 take a turn in the Service Unit 3, p. 18) has been made by CAB member John Lee.

In a dissenting opinion, Lee calls the majority action "merely another in a series of decisions which confirm the Board's long established policy of limiting the routes and the number of airlines and money closer toward the objective of stabilizing the local service carrier as measured by the majority in the recent ACCC policy study."

According to Lee, the majority has thrown away an opportunity to strengthen a local service carrier, Oak, Atlanta, by dropping up one of the country's strongest feeder routes and going it to United Air Lines and Braniff Airways, neither of which will provide service designed to develop short-haul traffic.

Lee disagrees with the majority on six points:

- He opposes the finding that local Route 196 cannot provide adequate service to its points on the grounds that the route never has been operated by a local service airline but always has been run by a trunk carrier.

- He feels that, contrary to the Board's opinion, the route has made progress toward satisfying already need. He believes it would continue to show substantial gain under a feeder that would concentrate on developing local business.

- He says the bulk of Route 196 traffic goes to and from Chicago, rather than from City—a typical feeder characteristic. He claims the Chicago-Atlanta bottleneck will not be broken by turning service over to trunklines, likely to give potential long-haul gains to local traffic.

- He believes application of Quick and

North Central Airlines should have been considered before changing the route.

He feels that such arguments that United can provide better customer service beyond Route 196 terminals, since this is true of any large airline and such policy would lead to demands lowering the big carrier.

- He feels the majority has misapplied Quick's expense and traffic development potentials on the route.

Lee feels moving the route to Quick and extending Braniff's Route 48 from Waterloo to Chicago.

Mackey Will Expand Nassau-Florida Route

Mackey Airlines now can offer expanded service between Nassau, British West Indies, and Florida under terms of a Civil Aeronautics Board decision.

CAB awarded Mackey's certificate to include Tampa and St. Petersburg, Fla., on its route.

The Board also issued a temporary exemption allowing Mackey to start service immediately and take advantage of the heavy winter season traffic. The airline's license at transportation certificate will go into effect on Feb. 14, 1955.

Mackey has been serving Nassau from the over-the-water West Palm Beach/Palm Beach and Ft. Lauderdale. The new certificate authorizes Tampa and St. Petersburg in over-the-water and Ft. Lauderdale and West Palm Beach/Palm Beach as intermediate points.

CAB ORDERS

(By STS)

ORDERED

United Air Lines' proposed four airports associated with May 31 and an airport not of their substance.

Los Angeles Airways' final and initial Board is proposed by the Board, since no objection to them was filed during the allotted period.

GRANTED

City of Detroit and the Detroit Board of Commerce have to intervene in a new routing Delta-CAS Air Lines' proposed route to Ft. Wayne, Ind.

AMENDED

Spokane Air Services' endorsement to conduct an extensive maintenance survey to terminate Jan. 31.

Investigation and suspension order concerning National Airlines' proposed log-

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and several approaches and go from to you

I am entitled to express my concerns over a current problem, one which affects all of us. The speaking of the antiquated VFR traffic law and the manner in which it is designed all mean of the before strong system. It seems to me completely negligent for the FAA not to have this regulation adjusted to the current traffic conditions. Likewise, it is a helpless failure to continue a path of conservancy and an otherwise simply because of this deficiency. Unless steps are taken to change the obsolete VFR law and to make down on an appropriate pilot, who play it is the least, there is but a great apathy in being call some serious concerned.

In its present status it is pitifully inadequate because of increased traffic, increased poaching, and no basic means of subsistence even if it were a good law. There are no traffic rules or regulations with the exception and there must be! The VFR law is like an "open door" where anything can happen and surely does. This is not a matter changed by our new law neither, and is potentially the most devastating violation of otherwise reasonable

The art of work. Therefore it encourages the art of the real. Consequently, the games, the falsest and unconvincing plot, is responsible for spending this way of life. An offering was particularly to the VHS sales also designed its limitations. He's the fellow who takes up a great year on the ground, deeply describing all his "things," but who actually has a lot of the study was the common dreamer to Me as I've said, and falls at attention to the world, and the world is not a thing, but a thing, and a thing without any idea. All of us who try by his hand that to the end of beauty and consciousness to find know him, to be true. Personally, I've found of this author designed for Me and back

New what is there that might be done about this situation? I believe the answers are many. Perhaps the ones which I feel best are too strong for his cause; nevertheless, they don't affect the plot whose success has no superseding his pleasure and himself.

1. Abolish the present VFR, low ceiling.
2. Increase VFR limitations to a ceiling of 1,300 feet and a visibility of five miles.
3. Abolish the so-called controlled VFR approach and departures from airport areas. This has never been anything but a system to cheat legally, and it encourages existing instrument pilots.

5. Dependent of central tower operators, CAA spends and disposes manages as that they can say yes or no to anyone who wants to spend in conditions less than those imposed in days No. 2. The regulations must be brought home in three volumes by means of heavy fines and heavier sanctions. This type of "big stick" enforcement is necessary. Nothing can be done at present because no one has the power and the authority.

1. Along the 700-foot runway boundary. When the weather is less than 1,000 and vis, no VFR traffic should be operating. Have you ever broken, contact down?

an environmental approach and so true to my roots, runs a collision with some VP "doctors" (coming along right in the middle of the incident). I have. That is not unusual to me. I don't care to do yet, but I stand a damn good chance unless the CMA catches the situation. The way the law is written now, the VP, just in the middle of the approach, commits a foul!

5. Institute a workplace campaign to get some down-to-earth understanding in the minds of these valiant. Encourage them to think instead of having their heads "up and behind" all the time.

Plaza notes that it makes no reference to me talking about instrument control capabilities. My list is all to the many ways he'd avoid oil crises throughout the country who are doing a magnificent job with the available facilities and manpower. They could be more appreciative, more personal, and more appreciative from the many "green diapers" who grate our brains today. Their responsibility of controlling all instrument traffic is contributing greatly to the advance safety of thousands of pilots and millions of passengers.

G. W.

The headline over year December 4th story on the no exchange case, now in CAB hearing stage, makes it appear that there is a "black" between ACTA and IMATA, the two institutions seeking clearance of an exchange deal.

Actually, as I stated on the witness stand, ACTA has an algorithm in IMATA operating in an exchange similar to the one we proposed, either separately or jointly with us. The two groups had a joint control board from which IMATA withdrew a year ago. Though we have continued to run traffic study, we have shown less willing to

In the air exchange proposal, there is no big difference except that IMVTA adds only the payload charges. ACTA thinks multiple charges within reasonable limits, as needed to develop better service than there

group of passengers on a plane or ship from more than one shopper. We think it would be good for the IMSTA members as well as ours if the border plan is approved.

At the BINTA, having thought of the exchange before ACTA, our minds have de-

major discussions in ACTA meetings months before the present. IMATA management took office though we chose to keep quiet at the time. But the Russians have been doing this sort of thing on the sea for 100 years. They began to talk about controlling it as far as 1931 and did so in 1945, before other ACTA or IMATA was formed. So U.S. property means little and is not a factor.

pending case:
 El D Jaramuz
 President
 Aircraft Transport Association, Inc.
 Suite 211, Wharf Building
 777 14th Street, N.W.
 Washington, D. C.

The lead-off article in your November 22nd issue, "TAC Slaps Mobile Atomic Jerks Four," attracted considerable and favorable attention here. May we have your permission to reproduce this article for use in our regular pages, as well as in the local and state site through a public information office?

We will be careful, of course, to give full credit to American Week as the source.

Best regards,

CAROL ANNASTON, is
Public Information Department
Lockheed Aircraft Corp.
Georgia Division
Marietta, Ga.

It was generous of you to give the Flight Safety Foundation such recognition in your editorial of Jan. 3, 1993. We especially appreciate the fact that the editorial of you and your staff in aviation safety is so strong that you not only devoted a full editorial page to it but continuously emphasize safety in your other editorials and articles. We believe that your editorial comports with the interest of the aviation industry on this vital

These are two seminars in the list of organizations that attended the Division. Walter Kilde Company which has long supported the activities of the Flight Safety Foundation both morally and with funds, and also the Canada Amusement Laboratory.

James L. Loefer
Office of The Managing Director
Flight Safety Foundation, Inc.
47 Park Avenue
New York 10, N. Y.

A recent feature on the Dodge AWD, written by my old friend Dave Halpin, confirmed a suspicion: in the effort that this is the first Jeep vehicle to be equipped with a sliding vertical tail and wags. The document is not quite true.

In the history of astronomy, it might be useful to correct the information. The North American A1-J Savage has been at active quadrate since 1990, and has the same feature. The A12 and A13J also are equipped in a like manner. But that is not the real. One even XATJ1 was also equipped with a holding vertical tail and sliding wings, and they design can also focus pins to the top edge of the XATD-1.

I am an active relation enthusiast here way back, and I must say that just magazine is the only American journal on the subject that is worth reading. The reading is

Warren M. Jones
Senior Engineer, F35H Project
North American Aviation, Inc.
International Airport
Los Angeles 45, Calif.

Super Power Tubes Open Way to Electronic Advances

The great tube you see illustrated here is the first Megawatt Pipelines ever built for military use. It is also the first of a series of Navy Physics Laboratory producing millions of watts of precisely controlled radio power. Developed by Sperry and the Air Research and Development Command primarily for defense purposes, its capabilities indicate that potential uses are virtually unlimited.



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IN ATOMIC ENERGY—Searry's new Magawell Flybrons provide steady driving power for larger atom smashers and high-energy beams. Available in 100, 200 and 300 watt models.



Eight test tail the first (Haworth) Hybrid Aircraft developed for military purposes by Learny developed 1,000,000 watts of power with up to 100,000 lbs and 30 in. wide. Other Haworth Hybrids are now in production.

FOR FURTHER INFORMATION: Qualified organizations can receive information on these super-power tubes to aid in electronic system design by writing to our usual Electronics Department.

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